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TRANSACTIONS

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OF LONDON

VOL. 87. 1938.

ON THE TAXONOMY OF RHYNCHOPHORA LARVAE (COLEOPTERA)

By FRITZ VAN EMDEN.

(Imperial Institute of Entomology, British Museum, Natural History.)

[Read 2nd February, 1938.]

WITH ONE HUNDRED AND EIGHT TEXT-FIGURES.

VERY little has as yet been published on the taxonomy of weevil larvae. Böving dealt in 1927 (*Proc. ent. Soc. Wash.* **29** : 155–157) with the Barini, Zygopsini, Cleonini and some related tribes. In 1931 (*Ent. Amer.* (n.s.) **11** : 14–15, 66–67) he divided the Rhynchophora into the two series Platystomoidea and Curculionoidea. The latter are subdivided into ATTELABIDAE, APIONIDAE, CURCULIONIDAE and CALENDRIDAE. The BRENTHIDAE, PROTERRHINIDAE, SCOLYTIDAE and PLATYPODIDAE also form part of the Curculionoidea. The chief characters used by him for subdividing the CURCULIONIDAE auctt. are the body-folds. The only other paper dealing with the whole of the family CURCULIONIDAE is by Gardner, 1934 (*Ind. For. Rec.* (*Ent.*) **20** (2) : 1–48, 6 pl.). For primary subdivision he used the antennae. His paper included more than 40 genera from the Oriental Region, and contains the largest amount of taxonomic knowledge of weevil larvae yet published. The subdivisions created by Böving were not employed. Keys to a good number of Indian genera and species of SCOLYTIDAE, ANTHRIBIDAE, BRENTHIDAE and PLATYPODIDAE have also been published by Gardner. A number of larvae of broad-nosed weevils have been studied by H. H. Keifer (1932 *Ent. Amer.* (n.s.) **13** : 45–84) and an important paper by R. T. Cotton (1924 *Proc. U.S. Nat. Mus.* **66** (5)) deals with the larvae of North American CALANDRINAE. Not one of the remaining papers on Curculionid larvae compares a greater number of genera and they are, in the main, descriptions of larvae of single species or genera. A comprehensive study, including

European genera, seemed therefore to be needed urgently from the taxonomic point of view. Moreover, I have received for identification more and more noxious weevil larvae which could not be satisfactorily identified, so that from the economic point of view a study of the European larvae of this family was important. Finally, in systematic work on adult weevils I realised that the condition of characters, whether primitive or acquired, can often not be judged reliably from the adults alone, and I hoped to obtain clearer results in studying the larvae.

I was enabled to commence my work when Dr. C. Urban of Schönebeck presented me with nearly all the species of larvae obtained by him and with his valuable collection of microscope slides. My thanks are due, therefore, primarily to him, who has advanced our knowledge of the biology of these insects so particularly, and has himself published many valuable descriptions of larvae. I have been further helped with specially rich material by Dr. A. G. Böving and Dr. E. A. Chapin of Washington (U.S. National Museum), Mr. J. C. M. Gardner of Dehra Dun (Forest Research Institute and College) and Dr. K. Henriksen of Copenhagen (Universitetets Zoologisk Museum, Copenhagen). Other valuable material has, so far as this first paper is concerned, been obtained from J. D. Alfken of Bremen, P. Bovien of Copenhagen, J. Bruneteau of Bordeaux, H. Dietze of Leipzig, J. A. Downes of London, Dr. P. van der Goot of Buitenzorg, Dr. W. Horn of Berlin-Dahlem (Deutsches Entomologisches Institut), Dr. O. Jancke of Naumburg-Saale, H. Jarvis of Stanthorpe, Queensland, R. Korschefsky of Berlin-Dahlem, Dr. S. Leefmans of Heemstede, Dr. H. Madle of Trier, F. Nevermann of San José, Costa Rica, G. Polentz of Breslau, A. Reichert of Leipzig, W. S. Rolfe of Wye, Kent, E. C. Rosenberg of Copenhagen, Reg.R. Dr. W. Speyer of Stade (Biologische Reichsanstalt für Land- und Forstwirtschaft), Reg.Rat Dr. J. Thiem of Berlin-Dahlem (Biologische Reichsanstalt für Land- und Forstwirtschaft), Dr. J. van der Vecht of Buitenzorg, H. Wiessner of Meissen. To all of these gentlemen I wish to give my sincere thanks. With their help it has been possible to deal with all the fifteen British and some other genera of the groups defined on p. 7.

A grant from the Society for the Protection of Science and Learning has enabled me to continue and finish this paper at the British Museum (Natural History), where the collection was made available to me by the courtesy of Dr. K. G. Blair.

As often happens in insects of uniform appearance, weevil larvae prove to be rich in sharp characters, the more important of which may be discussed briefly :

The *head* may be free (figs. 3, 4) or more or less retracted (figs. 88, 98). The latter condition is found, curiously enough, in the most primitive groups, but rarely in the others. The epicranial suture (fig. 11 *es*) is nearly always present, so that the frontal piece very seldom reaches the occipital foramen (*Rhamphus*, fig. 14). The frontal sutures (fig. 11 *fs*) meet the articulating membrane of the mandible in the Orthoceri and APIONINAE (figs. 2, 3), as well as in the ANTHRIBIDAE, (BRUCHIDAE)* and BRENTHIDAE, the antennae being completely enclosed by the frontal piece, whereas these sutures are separated from the membrane by a sclerotised process of the epicranial halves (*p* in figs. 1 and 4), connecting these to the frontal piece, in all the less primitive groups of weevils and in the SCOLYTIDAE and PLATYPODIDAE.† Generally, in these groups, the antennae are

* The brackets in this and other comparable cases indicate that the family does not belong to the Rhynchophora, though allied thereto.

† The inner (dorsal) part of the process is feebly sclerotised in the species of PLATYPODIDAE studied.

apparently free, as only an inconspicuous sclerotised bar connects the outer margin of the frontal piece to the front margin, so that the frontal suture seems to curve round into the basal membrane of the antenna (fig. 1). The fainter connection between the frontal piece and the epicranial halves exists, then, upon the inner side of the antenna (*fc* in fig. 1), whereas it is, of course, on the outer side in the primitive groups. Sometimes the bar between the outer and front margin of the frontal piece becomes broader, and the antennae are then evidently enclosed by the frontal piece. This condition is found in the CALANDRINAE, where the basal membrane of the antenna becomes very small, and in *Scymnoplastophilus* Voss (PRIONOMERINAE) and *Rhynchaenus*. These groups can nevertheless be separated from the Orthoceri, etc., by the sclerotised process which separates the frontal suture from the articulating membrane of the mandibles. The character seems thus to be of primary importance. The middle line of the frontal piece is often visible as a dark line, caused by the endocarina, a sclerotised, simple or sometimes bifurcate endoskeletal keel.

The number of *ocelli* is certainly of some taxonomic value in weevil larvae, but as it is often impossible to determine it from a few specimens, much use has not been made of it in the following keys.

The *antennae* are usually reduced to a single (of course bristleless) sensorial cone, for convenience treated as a segment in the keys, and a basal membrane, bearing some bristles and smaller sensorial cones (figs. 20–23). In the CEUTHORRHYNCHINAE and Adelognatha, to be dealt with in later papers, the main cone is short and hemispherical (fig. 17), viz. short, broad and strongly compressed (van Emden, 1935, *Arb. phys. angew. Ent.* **2** : 280, f. 6). Only in the Orthoceri is a distinct basal segment to the main cone (figs. 18, 19) present (except in *Allocorrhynus*, *Apoderus coryli* L. and first-stage larvae * of *Attelabus*).

The *labrum* usually has 4 pairs of bristles (figs. 31, 38). In the Orthoceri, ANTHRIBIDAE (and BRUCHIDAE and primitive CHRYSOMELIDAE) with a pair of basal sensillae (fig. 33 *bs*), in APIONINAE and all other CURCULIONIDAE (also in those BRENTHIDAE I have studied) with 0, 1 or 3 sensillae. In a few of the higher forms with 3 sensillae (some Cryptorrhynchini, some Zygopsini, some individuals of *Anthonomus*) the middle one may become very faint and sometimes indistinct; it is then pushed to the left side and situated above the left epipharyngeal rod, a curved, sometimes very fine channel connecting the ventral surface opposite the original spot with the acquired one.

The *epipharynx* has a pair of epipharyngeal rods (figs. 32, 44 *er*) in the CURCULIONIDAE, BRENTHIDAE, SCOLYTIDAE, etc., but no rods are present in the ANTHRIBIDAE, (BRUCHIDAE), BELINAE or ALLOCORRHYNINAE or in a few forms of CURCULIONIDAE with fused (some *Gymnetron*) or modified (*Orobitis*) labrum. The strong bristles at the front margin outside the tip of the rods I call antero-lateral setae (only the number on one side is quoted), those within the rods, antero-median setae (the total number being quoted), those behind antero-median setae and between the rods, epipharyngeal spines.

The *maxillae* (fig. 71) usually have 2-segmented palpi without a palpiger, a primitive condition being found in *Belus* (palpus 3-segmented, palpiger present) and Rhynchitini (palpus 3-segmented).

The *labium* (fig. 76): In order to facilitate comparison I employ the terms used

* There can scarcely be any doubt that 2-segmented antennae are more primitive than 1-segmented antennae, especially as they are associated with other primitive characters (frontal suture complete, maxillary palpi often 3-segmented, two tergal folds, etc.). So these first-stage larvae of *Attelabus* (which sometimes present another acquired character at the mentum) apparently contradict Dollo's law.

by Böving and Craighead (1931 *Ent. Amer.* **11**), though I am not satisfied that the morphological interpretation of the labium by Snodgrass is correct. In my opinion the term " submentum " applies to the part corresponding to the cardines and the term " mentum " to the part homologous to the stipites of the first maxillae; " prementum " ought thus to be used for the fused palpigeri. If the muscles attached to the prementum of the adult *Harpalus* (Anderson, 1936 *Smithson. misc. Coll.* **95** (13)) are really homologous with those attached to the larval prementum according to Anderson's view, it is clear that the trident-shaped sclerome of the labium of the CURCULIONIDAE belongs to the prementum. But these two pairs of muscles, in my opinion, resemble the two pairs of muscles attached to the outer and inner base of the stipes, and thus suggest a homology of the " prementum " of Anderson with the stipites of the first maxillae, and the denomination of this part of the labium as " mentum." In this connection I wish to thank Mr. A. W. Rymer Roberts of Cambridge for a copy of Anderson's paper and some drawings of the labium of Curculionids with muscles.

In a recent publication, which appeared shortly after this paper was presented for publication, Mr. G. M. Das (1937, *Q.J. micr. Sci.* **80** : 39–80, 12 pl.) arrives at the same morphological interpretation of the labium as above, *e.g.* that the " prementum " is homologous to the stipites of the first maxillae, etc. He does not, however, re-establish the original terms mentum for the fused stipites and submentum for the fused cardines. I am very much indebted to Dr. O. W. Richards for sending me a copy of Mr. Das' paper.

Tergal folds of abdomen: Two in the ANTHRIBIDAE (with some restrictions), (BRUCHIDAE, primitive CHRYSOMELIDAE), Orthoceri (fig. 98) (condition indistinct in *Belus* (fig. 88)), APIONINAE (condition indistinct in *Cylas* (fig. 89)), OROBITINAE, STENOPELMINAE, MECININAE and RHYNCHAENINAE, 3–4 in all * other CURCULIONIDAE (fig. 99), BRENTHIDAE and PLATYPODIDAE, 2 or 3 in SCOLYTIDAE (according to Gardner), the second of three folds generally without bristles. The front fold is divided in the Orthoceri, etc. (figs. 97, 98), by two posteriorly converging furrows into a median part, which is rounded posteriorly, and two subtriangular lateral parts, containing the spiracles. In the groups with 3–4 folds these lateral parts meet in the middle of the dorsum and form the second fold, so that the spiracles are then situated in the second fold, which is, however, morphologically only part of the first fold.

Legs: Curculionid larvae are devoid of legs, but in their place are often, more or less prominent, rounded humps (pedal lobes), which may bear a circular, feebly convex sclerite on the tip (pedal disc (fig. 89)). Beyond this they are never segmented, though in mature larvae an apparent articulation may be caused by the imaginal discs of the legs. In the ANTHRIBIDAE (except *Araeocerus*) and most BRENTHIDAE, however (as well as in the BRUCHIDAE), more or less pointed and segmented legs are present.

The larvae of the CURCULIONIDAE, inclusive of some related families, may be defined thus (Böving and Craighead, 1931, *Ent. Amer.* (n.s.) **11** : 10–15): legs absent, cerci absent, maxillary mala well developed, no ventral crushing tubercle (van Emden, 1935 *Stettin. ent. Ztg* **96** : 183), outer lobe of maxillae fused with inner lobe and stipes, spiracles not cribriform, gula absent, mandibles without molar part, hypopharyngeal sclerome absent, 10th abdominal segment in front of anus without a pair of soft oval lobes, separated by a longitudinal groove, hypo-

* *Phylaitis grewiae* Mshl. has, according to Gardner, only 2 apparent folds. From some larvae of this species, which Mr. Gardner was kind enough to send me, I can state that the first of the three folds is distinct though small on abdominal segments 1–3, indistinct or fused with the second fold on the other segments.

pharyngeal bracon present (except in RHYNCHAENINAE, which are leaf-miners). Other important characters are : mala maxillae not borne on palpiger, labial palpi present, epicranial suture present (except in some leaf-miners), mouth-parts retracted, cardo present, directed outward.

By this definition not only the ANTHRIBIDAE (legs generally, mola and hypopharyngeal sclerome present) and most BRENTHIDAE are excluded from the remaining Rhynchophora, but also the NEMONYCHINAE, represented by *Cimberis* (*Rhinomacer*) *pilosus* Lec. (figs. 27, 28), for the larva of which I am indebted to Dr. A. G. Böving, are removed. Besides the characters mentioned, Anthribid larvae present the following, with which *Cimberis* agrees fully : Antennae 1-segmented, conical. Frontal sutures complete in front, reaching articulating membrane of mandibles. Labrum with one pair of basal sensillae. Epipharyngeal rods missing. Labial palpi narrowly separated.

As *Cimberis* agrees fully with Anthribid larvae in these characters and those stated by Böving, it is scarcely possible to separate members of this genus as a group with the Curculionids, from Anthribid larvae. Also in the adult stage the NEMONYCHINAE may, because of their free labrum, be more conveniently placed among the Anthribids than among the CURCULIONIDAE (see keys to families of Rhynchophora, in which NEMONYCHIDAE are mentioned as exceptional: Reitter, 1913, *Best.-tab. europ. Coleopt.* **68** : 1 ; 1916, *Fn. Germ.* **5** : 1 ; Marshall, 1916, *Fn. Brit. Ind. Col. Curc.* **1** : 3 ; Blatchley and Leng, 1916, *Rhynchoph. Weev. N.E. America* : 17 ; or are regarded as a special family near ANTHRIBIDAE : Bedel, 1882, *Fn. Bassin Seine*, **6** : 3). It is, of course, of minor importance whether one retains the NEMONYCHINAE as a family, or, as I should prefer, in order to reduce the far too great number of Coleopterous families, unites them to the ANTHRIBIDAE. At any rate, it should be stated that their larvae can be distinguished from all the known Anthribid larvae as a special subfamily by their clypeus, which is not separated from the frontal piece and only partly from the labrum.

As systematic views on the URODONTINAE still remain fluid, it is desirable to deal shortly with their larvae. The lack of a hypopharyngeal bracon, hypopharyngeal sclerome, mola and labial palpi excludes *Urodon* from the ANTHRIBIDAE and unites it to the BRUCHIDAE in Böving's series Chrysomeloidea (the same negative characters are found in some HALTICINAE, which may be distinguished by well-developed legs (Böving and Craighead, 1931, *Ent. Amer.* (n.s.) **11** : 63–64)).*

Since their larvae approach the BRUCHIDAE and cannot be associated with the ANTHRIBIDAE, and as the adults are certainly as nearly related to the Bruchids as to the Anthribids (Jordan, 1924, *Proc. ent. Soc. Lond.* **1924** : xcviii), it is evident that *Urodon* must be placed near, or with the BRUCHIDAE.

Other important characters of the larvae of *Urodon rufipes* Ol., for specimens of which I am indebted to Dr. Urban, and of *Urodon* sp. from S. Africa, which Dr. Böving kindly lent me, are the following : Antennae 1-segmented, conical. Clypeus sclerotised, separated from labrum, fused with frontal piece. Labrum with two basal sensillae. Epipharyngeal rods missing. Tip of mandibles with several teeth. Maxillae without inner lobe, palpi 2-segmented, without palpiger. Mentum and sub-mentum without sclerite. Rudimentary legs missing. Abdominal tergites with two transverse folds.

As all other known larvae of the BRUCHIDAE differ from *Urodon* in some of

* Bridwell (1932, *Proc. ent. Soc. Wash.* **34** : 102) must have misunderstood Böving when he wrote that the latter had told him that the larva of *Urodon* is very near to the ANTHRIBIDAE, and without the special characters of the BRUCHIDAE, the contrary being true.

the characters mentioned (viz. Antennae several-segmented. Clypeus separated from frontal piece. Tip of mandibles simple. Mentum and sub-mentum fused, with shield-like sclerome. Rudimentary legs present, in first-stage larvae legs complete), it follows that the URODONTINAE should be regarded as a distinct subfamily.

One of the reasons suggesting a taxonomic study of Curculionid larvae was the phylogenetic importance of the characters of the adults. One would consider sub-homonomous antennae, short angulate rostrum, with little-developed scrobes, free maxillae and simple mandibles as more primitive than geniculate antennae, long sub-cylindrical rostrum, maxillae hidden by an enlarged mentum and mandibles with scar and appendage. Unfortunately these adult characters have been evolved independently, or those groups in which primitive conditions are present with regard to these characters show high specialisations in other respects, which do not permit them to be regarded as undoubtedly primitive. There can, however, be little doubt that complete frontal sutures, geniculate antennae, paired basal sensillae of the labrum and two abdominal folds are primitive characters, and that a group of larvae presenting all of these characters must be nearer to the ancestral weevils than any other. All these characters are preserved in the Rhynchitini, which have, moreover, 3-segmented maxillary palpi. On the other hand, *Belus* has the same characters, but even the palpiger is present, and the epipharynx is specially primitive, though the abdominal tergites are not distinctly divided. Thus, as a whole, *Belus* is not less primitive than the Rhynchitini, and the other tribes of the RHYNCHITINAE as well as the ALLOCORRHYNINAE approach these groups in most of their characters. These groups may be called Orthoceri, and in the adult stage are defined as (phanerognathous) weevils with minute trochanters and straight antennae with loose, or no, club.* In addition to the groups mentioned, only the PTEROCOLINAE and OXYCORYNINAE present these adult characters, and their larval characters may thus be expected to be two tergal folds and the characters given in paragraph 1 of the key.

Complete frontal sutures and two tergal folds (but not the other primitive characters) are also found in *Cylas* (conditions of tergal folds somewhat uncertain, see p. 10 and fig. 89), *Apion* and *Nanophyes*. As the adults in most genera of the APIONINAE (*sens. lat.*, including the Eurhynchini with *Cylas* as well as Nanophyini) have straight antennae, some of them also a loose antennal club, the characters of both adults and larvae point to a moderately primitive position after the Orthoceri.

Larvae of APIONINAE may be defined by the two tergal folds of the abdominal segments and the characters shown in paragraphs 12 and 13 of the key, their adults by either long trochanters separating the femora from the coxae, or the combination of straight antennae with a loose club (or at least a normal articulation between segments 9 and 10 : *Cylas*) with covered pygidium, simple claws and smooth back to the mandibles.†

* The primitive position of these orthocerous weevils has early been recognised, but so has, none the less, the difficulty of discriminating between these primary orthocerous groups and those in which straight antennae are more or less certainly acquired (e.g. *Cryptodermus*, *Episus*, etc.).

† The Eurhynchini link the APIONINAE closely with the RHYNCHITINAE, which, except Auletini, may be distinguished by the exposed pygidium. In the Auletini the pygidium is mostly covered, but the tips of the elytra are rounded and the pygidium is formed and sculptured like a free pygidium. The appendiculate claws (except *Auletes tubicen* Boh.) or exodont mandibles (*Auletes tubicen* Boh. and most other Auletini (Voss, 1933, *Stettin. ent. Ztg* **94** : 108)), would exclude the Auletini with covered pygidium from the Eurhynchini.

It was surprising to find two tergal folds in a few other groups, and at first I considered this a reason for not laying too much stress on the condition of the tergal folds. From further research, however, it became evident that all the available genera of the groups concerned have only two folds; that there exists apparently some relationship between these groups; and that they are connected with the APIONINAE by *Nanophyes*. These groups are the RHYNCHAENINAE, MECININAE, STENOPELMINAE and OROBITINAE. In Reitter's keys (1913, *Best.-tab. europ. Col.* **68**: 58–59; 1916, *Fn. Germ.* **5**: 120) the relationship between adult Nanophyini and the RHYNCHAENINAE-MECININAE * is shown, and in Winkler's Catalogue the STENOPELMINAE, MECININAE (incl. of *Nanophyes*) and RHYNCHAENINAE immediately follow each other. *Orobitis* is usually placed among the CEUTHORRHYNCHINAE, but Bedel (1884, *Fn. Bassin Seine* **6**: 66) regarded the genus as isolated on account of its first abdominal segment, which is divided into three parts by the hind coxae. The larvae differ greatly from the CEUTHORRHYNCHINAE, having neither 3 tergal folds nor the peculiar hemispherical antenna of this group (comp. figs. 17 and 21). Though no adult character common only to these groups, which may at present be comprised under the name MECININAE group, is known, I treat their larvae as a group standing between the APIONINAE and the Gonatoceri. They are characterised by two tergal folds and incomplete frontal sutures.

Practical reasons, too, make it advisable to deal with this group in this paper, together with the Orthoceri and the APIONINAE, for the condition of the tergal folds can more easily be judged in field work or in living larvae than that of the frontal sutures, though the latter may have a greater phylogenetic importance. Moreover, the great group of gonatocerous Phanerognatha is, as regards the larvae, much in need of subdivision.

A general scheme for the main groups of the CURCULIONIDAE according to larval and adult characters may be drawn up as follows.

SCHEME.

larvae			adults	
A. Two tergal folds (if condition uncertain, frontal sutures complete in front)	a. Frontal suture complete in front	Orthoceri	1. Antennae straight with loose club, or trochanter separating femur from coxa	I. Maxillae free. No scar.
		APIONINAE MECININAE-group		
		Phanerognatha: Gonatoceri	2. Antennae geniculate or with fused club, trochanter normal, femur and coxa touching each other	II. Maxillae covered, or scar present.
B. Three tergal folds	b. Frontal suture incomplete in front	Adelognatha		

The subject of the present paper is the larvae comprised under character A of the scheme. The BRENTHIDAE are separated from this group mainly by their distinct, though small legs, and always by having 3–4 distinct tergal folds (which are associated, in the scanty material of this family at hand, with the primitive character of frontal sutures reaching the articulating membrane of the mandibles), the PLATYPODIDAE by the curious sclerotised rings on the pronotum (their body-folds, frontal suture, etc., would unite them otherwise to Gonatocerous Phanerognatha). Most of the SCOLYTIDAE, moreover, agree with the latter in body-folds and frontal sutures, but some genera possess, according to Gardner (1934, *Indian For. Rec.* **20** (8)), only 1 or 2 tergal folds. These may be distinguished from the genera comprised under paragraphs 17 and 22 by the lack of air-tubes in the spiracles or by the basal stalk of the mentum. The

* The larvae of *Cionus* and *Stereonychus* as well as of *Alcides* have three tergal folds and do not belong to this group. *Alcides* has probably been united to the MECININAE by mistake, as the funicle of the antennae consists of 6 segments.

PROTERRHINIDAE (Böving and Craighead, 1931, *Ent. Amer.* (n.s.) **11** : 66, t. 119) are very similar in the larval stage to *Belus*. The body-folds are apparently not distinct, the condition of the anterior end of the frontal suture is unknown, and the antennae and head are very similar. They may be distinguished from *Belus* by the characters quoted in Böving's key as characters differentiating them from all other CURCULIONIDAE, but in *Belus* the head is more similar to that of *Proterrhinus* (and perhaps in some species even dilated posteriorly) than in any other Curculionid, and the genus will perhaps prove to be really related in the larval stage to *Proterrhinus*. It may be mentioned that the antennae of the adults are devoid of a club and are straight in *Proterrhinus* as well as in *Belus*.

The present paper is chiefly concerned with generic characters, which have been specially studied. But characters for the species at hand will also be found, as I wished to prove that even in such apparently homogeneous groups as weevil-larvae species may be recognised. I realise, of course, that for a detailed study of the species of different genera a richer and more adequate material (of some of the species mentioned I have only had parts of the head, of others single specimens, which I was not allowed to dissect) will be necessary, before really satisfactory keys to species can be produced.

As far as possible I have tried to study specimens mounted on microscope slides in the same position. For this purpose the extended body-skin and the maxillary complex (dorsal face downwards) are united under one cover-glass, the head capsule (the mandibles of which have been widely opened before transferring the specimen into absolute alcohol) under another cover-glass, which is supported by four small balls of plasticene. These supports are then carefully pressed, until the head is just kept in position without being distorted. The figures of mandibles are all drawn in the position described, though some variation is inevitable, *e.g.* the mandible of *Apoderus quadripunctatus* Gyll. is directed more upward than the others, but a mandible in this position has intentionally been chosen to illustrate this species. The arrangement of the frontal setae in *Apion* seems to be an important systematic character, but it can be judged satisfactorily only in specimens in exactly the same position. Thus the character has been used as little as possible.

In the keys the numbers in brackets refer to abnormalities observed in single specimens or occurring on one side only. These abnormalities are not rare in bristles.

I have placed first, as far as possible, characters which do not require dissection and which seem to be important as well as clear and reliable. The characters of secondary degree do not present all these advantages together.

Key to the subfamilies and tribes of weevil-larvae with two tergal folds.

1(12). At least vertex somewhat overlapped by pronotum, this part of head distinctly modified, but not emarginate (figs. 5–8). Labial palpi 2-segmented. 2 basal sensillae of labrum (figs. 29, 31, 33, 42). Antennae mostly distinctly 2-segmented, enclosed by frontal piece (as in APIONINAE), frontal sutures reaching articulating membranes of mandibles. Either numerous bristles at front margin of labrum or 2 antero-median bristles of epipharynx. Labrum and clypeus separate. 1 + 8 pairs of spiracles.

2 (5). Epipharyngeal rods missing. Head deeply retracted into thorax. Endocarina indistinct. (Either palpiger present, fig. 52, and prothorax of peculiar structure, fig. 88, or spiracle of thorax in mesothorax.) Only from America and the Australian Region.

3 (4). Maxillary palpi 3-segmented in addition to a distinct palpiger (fig. 52). Spiracle of thorax in intersegmental fold. Pronotum humped, posterior half with a transverse sclerotised plate, the anterior margin of which is more strongly sclerotised and keel-shaped (fig. 88). Abdominal segments without distinct transverse folds, 4th and 5th segments with a pair of flat dorsal ampullae (fig. 88). 10th abdominal segment distinct, anus subterminal, trilobed, T-shaped (fig. 106). Head much longer than wide, very deeply retracted, narrowing posteriorly (fig. 5). Body very hairy, especially pedal lobes of prothorax and posterior end of body. Antennae with one cylindrical well-sclerotised, bristle-bearing segment, a sensorial cone at its tip and a retractile and membranous but rather long and bristle-bearing base (fig. 18). Numerous bristles at front margin of epipharynx (figs. 29, 30). (*Belus*)
BELINAE.

4 (3). Maxillary palpi 2-segmented, without palpiger. Spiracle of thorax in mesothorax. Thorax simple, all body-folds flat but distinct. 10th abdominal segment very small, anus at ventral end of 9th segment, X-shaped (figs. 107, 108). Head not much longer than wide, moderately retracted (fig. 8). Body subglabrous. Antennae with 1 conical glabrous segment (as in Gonatoceri), bristles and sensorial cones only on the membranous basal area. 2 antero-median setae of epipharynx (fig. 42). (*Allocorrhynus*)
ALLOCORRHYNINAE.

5 (2). Epipharyngeal rods present, long. Head moderately or scarcely retracted (deeply retracted in *Eugnamptus*). Endocarina more or less distinct (figs. 6, 7). Palpiger missing, thorax normal, thoracic spiracle in intersegmental fold or in prothorax. Abdominal tergites with 2 distinct transverse folds. 2 antero-median setae of epipharynx . . . . . RHYNCHITINAE 6.

6 (9). Prementum and mentum separate (figs. 53, 76). Spiracle of thorax in the posterior, lateral part of pronotum. Both transverse folds of the tergites at least in abdominal segments 6–8 quite alike in convexity and very distinct (fig. 98). Spiracles bicameral (fig. 82). Antennae always with 2 well-developed segments.

7 (8). Maxillary palpi 3-segmented. First transverse fold of abdominal segments 1–4 not or scarcely more convex than posterior fold (figs. 97, 98). Skin-asperities very distinct. 2 exterior antero-lateral setae of epipharynx at the exterior part of front margin and side by side (figs. 32, 37). 9th abdominal tergite and sternite about same length, anus terminal, transversely X-shaped (figs. 98, 104) . . . Rhynchitini.

8 (7). Maxillary palpi 2-segmented. First transverse fold of abdominal segments 1–4 much more convex than posterior fold, protuberant and bilobed. Skin-asperities moderately distinct. First antennal segment longer than wide. 2 exterior antero-lateral setae of epipharynx at lateral margin, one much in front of the other. 9th abdominal tergite about twice as long as sternite, anus subventral, a simple transverse cleft, its dorsal lip rather large.—1 ocellus. Back of mandibles shining, with large, flat excavation, lower margin callous. Prementum somewhat bilobed, wide. Sclerite of pronotum complete but not very distinct. (*Dicranognathus*) . . . . . Auletini.

9 (6). Prementum and mentum fused and equally sclerotised (figs. 57, 73, 77). Maxillary palpi 2-segmented. Spiracle of thorax in intersegmental fold. Transverse folds of abdominal tergites separated only feebly and near middle-line, anterior fold more convex, posterior fold simply sloping, so that the whole tergite appears more convex and in nearly mature larvae even humped (figs. 96, 100–103). 9th abdominal

tergite at least double length of sternite, 10th segment scarcely or not reaching dorsal part of body. Sclerite of pronotum narrow, occupying only about half of its length. Skin-asperities inconspicuous.

10(11). Anus subterminal, with one large dorsal and 3 smaller ventral lobes, at the ventral posterior end of the 9th abdominal segment (fig. 100). Spiracles bicameral. Bristles of body rather sparse, normally inserted (fig. 93). Back of mandibles coarsely sculptured, shining, with a large, flat excavation, the lower margin of which is callous, cutting edge with a small—sometimes worn—subbasal tooth (fig. 24). Interior antero-lateral seta of epipharynx placed far behind the exterior one (fig. 34). Ligula wide, truncate or broadly rounded (fig. 73). Palpi stout, 2nd segment not, or scarcely, longer than first. Young larvae in some species with mask-like, strongly sclerotised appendix to labium (fig. 81) . . . . . Attelabini.

11(10). Anus ventral, at the base of 9th abdominal segment, a simple transverse cleft (figs. 101–103, 105). Spiracles annular (fig. 83) (except in first-stage larvae). Bristles of body rather numerous and long, inserted on small, fleshy protuberances (fig. 92). Back of mandible densely and finely rugose-punctate, dull, lower margin not callous, cutting edge without subbasal tooth (figs. 25, 26). Interior and exterior antero-lateral setae of epipharynx at about same level. Ligula narrow to moderately wide, rounded (figs. 64, 65, 77). Palpi moderately stout, 2nd segment distinctly longer than first. Apoderini.

12 (1). Middle of posterior end of head perfectly free (except, of course, during temporary contraction, visible without dissection by pushing the cervical membrane backward) (figs. 3–4, 9–14). 0–1 basal sensilla of labrum (figs. 35, 48, 50, 44). Labial palpi 1-segmented, rarely 2-segmented, but then the basal segment usually conical and rather indistinct (figs. 59–63, 72, 78, 79, 80). Epipharyngeal rods present, short, or all the middle part of labrum more strongly sclerotised and with 5 longitudinal ribs (figs. 35, 36), or clypeus and labrum fused (figs. 40, 41). Mostly 4, rarely 2 or 6, antero-median setae of epipharynx, if only two, labrum and clypeus fused or labial palpi 1-segmented.

13(24). Head free, hypognathous, rounded (figs. 10–12), truncate (fig. 9) or notched (fig. 13) at posterior end, endocarina not surpassing epicranial halves behind. Hypopharyngeal bracon present. Prosternum with 0, 2, 4 or 6 small sclerites (fig. 90). Frontal piece not surpassing $\frac{3}{4}$ of length of head capsule. Second pair of epipharyngeal spines more or less thin or missing.

14(19). Frontal suture reaching articulating membrane of mandible distinctly outside antenna (figs. 2, 3), antennae enclosed by frontal piece, fainter connection between epicranial halves and frontal piece outside antenna (can be judged best in entire larvae, whereas it is often not clearly seen in microscope slides). Maxillary mala mostly subparallel, generally somewhat narrower than basal segment of palpi, tip often truncate. Prementum almost always triangularly pointed basally (figs. 61, 59, 72). Skin-asperities not very conspicuous. Thoracic spiracle intersegmental, uni- or bi-cameral. Labrum normal, 2–4 (–5) antero-median setae of epipharynx, epipharyngeal rods present. Apioninae 15.

15(16). First abdominal segment with 2 dorsal folds, anterior fold divided in 2nd and following segments into several, irregular, narrow, transverse folds, constrictions between segments strong (fig. 89). Labial palpi two-segmented. Abdominal spiracles bicameral, 8 pairs present. Anus terminal, X-shaped, but dorsal lip much broader,

ventral lip much narrower than lateral lips. 1 basal sensilla of labrum. Endocarina distinct. (3–) 4 antero-lateral setae of epipharynx, 2nd pair of epipharyngeal spines much smaller and much less distant than first pair. Body rather slender, subcylindrical to semicylindrical (*Cylas*, figs. 3, 89) . . . . . Eurrhynchini.

16(15). Two distinct and not transversely divided dorsal folds on abdominal segments, constriction between segments faint, if body not particularly contracted. Labial palpi 1-segmented. Abdominal spiracles unicameral.

17(18). Labial palpi wider than long or as long as wide, pillbox-shaped to hemispherical (figs. 59, 61). Sclerite of basal segment of maxillary palpi incomplete towards mala (fig. 59). 0 basal sensilla of labrum. Anus a transverse cleft. 1 + 7 or 1 + 6 pairs of spiracles. Apionini.

18(17). Labial palpi much longer than wide, subcylindrical (fig. 72). Sclerite of basal segment of maxillary palpi complete, annular. 1 basal sensilla of labrum (fig. 74). Anus X-shaped. 1 + 8 pairs of spiracles. (*Nanophyes*) . . . . . Nanophyini.

19(14). Frontal suture separated outside antenna by a complete sclerotised bridge from articulating membrane of mandible (figs. 1, 4). Antennae (apparently: a bar, usually inconspicuous, connects outer margin of frontal piece to front margin) not enclosed by frontal piece, frontal suture apparently bent inward towards antenna, not distinctly reaching front margin. Fainter connection between epicranial halves and frontal piece thus on the inner side of antenna.

20(21). Skin-asperities extremely fine, arranged in distant transverse rows. Maxillary mala subparallel, truncate at tip, narrower than basal segment of maxillary palpi (fig. 60). Prementum obtusely pointed basally. Labrum broadly emarginate, 6 antero-median bristles of epipharynx, epipharyngeal rods missing, but labrum with 5 sclerotised longitudinal ribs between the antero-median bristles, somewhat emarginate between each pair of ribs (figs. 35, 36). Spiracles with 1 not annulate short tube, which is not defined against atrium (fig. 85). Labial palpi 1-segmented. (*Orobitis*) . . . . Orobitinae.

21(20). Skin-asperities very conspicuous, irregularly arranged. Maxillary mala more or less triangular, as wide or wider than basal segment of palpi, tip rounded (figs. 66–68, 71, 78). Prementum rounded basally (fig. 62), rarely pointed (fig. 78). Labrum otherwise. Labial palpi 1-segmented or more or less incompletely 2-segmented. Tubes of spiracles well defined from atrium (figs. 86, 87).

22(23). Thoracic spiracle in pronotum. Prementum pointed, a dark curved band on mentum surrounding posterior end of prementum (fig. 78). Endocarina short, shortly bifurcate, epicranial suture strongly sclerotised, epicranial suture + endocarina not quite half the length of head, hind margin of head in the middle line with a large, triangular notch (fig. 13). Front margin of frontal piece straight, somewhat prominent, side margins nearly truncate in front. Frontal piece reaching about $\frac{2}{3}$ length of head-capsule. Two very distinct and rather distant corneae (fig. 13). Spiracles bicameral. 1 pair of sclerites near middle line of pro- and meso-sternum. Basal segment of maxillary palpi complete, maxillary mala with a regular row of 7 strong setae, the basal 3 of which are curved towards buccal opening (fig. 78). (*Stenopelmus*) . . . . . Stenopelminae.

23(22). Thoracic spiracle intersegmental. Prementum rounded posteriorly, in some individuals somewhat pointed, no dark curved band on mentum. Endocarina long, not forked, together with epicranial

suture, which is only sclerotised near base, about $\frac{3}{4}$ length of head (fig. 12). Hind margin of head entire (if seen from in front) with a very obtuse reentrant angle (if seen dorsally). Frontal piece reaching about half to $\frac{3}{5}$ length of head-capsule, front margin not prominent, emarginate between its outer angles, which are prominent, side margins emarginate in front. Dorsal row of maxillary mala irregular, consisting of thin setae, sometimes the 2–3 basal ones much longer, but generally they are all rather short (figs. 66–68, 71)

MECININAE.

24(13). Head somewhat retracted, deeply and broadly emarginate at posterior end, frontal piece very pointed and about reaching occipital foramen, endocarina long and reaching far behind posterior end of epicranial halves near middle (fig. 14). Hypopharyngeal bracon absent. Pronotum with 1, prosternum (fig. 91) with 3 large sclerites (except in 1st-stage larvae). Skin-asperities very conspicuous (except in first-stage). Anus small, terminal, a transverse cleft. Two pairs of epipharyngeal spines (figs. 49, 51). Mandibles with 2 apical teeth and a flat and blunt extension behind them (figs. 46, 47). Labial palpi 1-segmented, widely separated (fig. 63). Leafminers

RHYNCHAENINAE.

Genera of Rhynchitini.

1 (4). Spiracles normal, not prominent. Ventral side of prothorax like that of meso- and meta-thorax with a pair of strong, oblique, posteriorly convergent furrows, without a sclerite and in consequence paler than mentum (fig. 94). Back of mandibles with a large, shallow excavation, the lower margin of which is callous (indistinct, if mandible worn). Head widest in or before middle (figs. 6, 7). Endocarina not forked, reaching about middle of frontal piece. Epipharyngeal rods subparallel, not very near to each other (except in *Rhynchites germanicus* and *pauxillus*). Ligula evenly rounded, bilobed or truncate (fig. 53). Prementum not prolonged at sides but with base more or less pointed along middle line (fig. 53). Mentum distinctly sclerotised towards middle. Dorso-interior row of spines of maxillae separate, mostly on a distinct though faint lobe (inner lobe ?), consisting of (3–) 4 spines. Labrum subtruncate to broadly emarginate (fig. 31), rarely somewhat trilobed, the outermost of the 4 bristles very conspicuous though much smaller than the next, almost at its side.

2 (3). Anterior transverse fold of abdominal tergites without ampullae (fig. 98). Ventral lip of anus moderately defined, very distinctly only towards anal opening. Mandibles with a small (sometimes worn) subbasal tooth (see fig. 24). Labial palpi separated by nearly twice their width (fig. 53). Sclerotisation of mentum smaller, not wider than prementum, bristles not arising near it (fig. 53). Dorso-interior row of spines of maxillae rather regular. . . . *Rhynchites*.

3 (2). Anterior transverse fold of abdominal tergites 1–5 with a pair of flat ampullae (fig. 97). Ventral lip of anus very sharply defined, even at proximal margin. Mandibles without a subbasal tooth. Labial palpi separated by scarcely more than their own width (fig. 76). Sclerotisation of mentum larger, a little wider behind than prementum, 2 bristles in its emarginations (sometimes even enclosed by it). Dorso-interior row of spines of maxillae forming a group rather than a row . . . . . *Bycticus*.

4 (1). Spiracles strongly prominent at posterior end. Ventral side of prothorax covered by a large, uniform sclerome (fig. 95), which in the older larva (of at least 3 mm. length) is distinctly more shiny than the

following sternites, without skin-asperities and more sclerotised than the middle of mentum. Back of mandible with a shallow excavation, the lower margin not callous though with a rather sharp edge. Head widest behind middle. Endocarina forked and the two branches reaching front margin of frontal piece. Prementum with base straight, truncate, with a posterior prolongation at the sides. Mentum scarcely sclerotised. Dorso-interior row of spines of maxillae continuous with dorso-apical row, consisting of 4 + 3 or 5 + 3 spines together (fig. I*e*). Labrum trilobed (figs. 37, I*b*, *c*), middle lobe sometimes indistinct in first-stage larvae.

5 (6). Head (fig. I*a*) strongly flattened, body-folds flat (leaf-miner). First antennal segment longer than wide (fig. I*a*). Antero-median setae of epipharynx extremely distant, almost as much as front end of epipharyngeal rods; these parallel, very distant (fig. I*c*). Ligula truncate, somewhat prominent in middle, very wide, more than twice as wide as palpus (fig. I*d*). . . . *Eugnamptus* (*hirsutus* Voss).

FIG. I.—*Eugnamptus hirsutus*. *a* head with front margin of pronotum. L 2, 2, o. *b* right antenna, clypeus, labrum. L 3, 3, g. *c* epipharynx, sides transposed. L O, 6, h. *d* labium. L 4, 3, a. *e* left maxilla. L 4, 3, a.

6 (5). Head not flattened (fig. 95), body-folds convex (larvae in leaf-rolls). First antennal segment wider than long. Antero-median setae of epipharynx side by side, about a quarter as far apart as front ends of epipharyngeal rods; these strongly converging and curved to behind middle, somewhat diverging towards posterior end, very near to each other behind middle (fig. 37). Ligula trilobed, not quite twice as wide as palpus, the middle lobe somewhat longer (fig. 56)

Deporaus (*betulae* L.).

Species of Rhynchites.

1(16). Head subparallel or dilated towards middle. Each half of posterior tergal folds with 4–5 long bristles (and often some small bristles anterior to them). Maxillary tooth (figs. 53–55) present (rather indistinct in *Coenorrhinus germanicus* and *pauxillus*). Ligula rounded or subtruncate. 3 antero-lateral setae of epipharynx.

2(11). Third paramedian prothoracic pair of bristles separated by not more than one and a half times the distance of the first pair.

3 (4). Third paramedian prothoracic pair of bristles scarcely more distant than first pair. Asperities of posterior part of pronotum just reaching half-way between 2nd and 3rd pair of paramedian bristles along middle line, just surpassing the 3rd pair in a straight line connecting the 2nd and 3rd bristles of one side of body. Pronotum scarcely sclerotised, spiracles pale. Proximal ventral sensillae of prementum obliquely posterior and lateral to proximal ventral setae, distal ventral sensillae somewhat more distant than distal ventral setae. Proximal spine of ventral surface of maxillary lobe rather far from maxillary tooth, which is obtuse and followed by a distinct emargination (fig. 54). Terminal segments of palpi subcylindrical, a little longer than wide. Epipharynx without sensillae immediately behind antero-median setae. (*Lasiorrhynchites*, *Coccygorrhynchites*) (figs. 53, 82) . . . . . *sericeus* Hbst.

4 (3). Third paramedian prothoracic pair of bristles distant about one and a half times as far as first pair or less, but in this case the asperities of the posterior part of the pronotum reaching 2nd pair of paramedian bristles. Proximal ventral sensillae of prementum at the outer side of proximal ventral setae. Distal ventral sensillae of prementum distinctly nearer to each other than distal ventral setae. (*Involvulus* and *Coenorrhinus*.)

5 (6). Pronotum pale, scarcely sclerotised, asperities of pronotum small, pale. Spiracles pale, not very conspicuous. Proximal spine of ventral surface of maxillary lobe situated just behind the tooth, so that no emargination exists, tooth smaller but sharp (fig. 55). Paramedian anterior seta of frontal piece more caudad than the next seta, at nearly same level as anterior sensillae (*Involvulus*). . . . *cupreus* L.

6 (5). Pronotum distinctly more sclerotised than the following segments. Proximal spine of ventral surface of maxillary lobe situated rather far from the tooth (at about twice its own width), so that the tooth is followed apically by a strong emargination and an oblique part of cutting edge (see fig. 54), tooth obtuse, sometimes indistinct. Paramedian anterior seta as in *cupreus*.

7 (8). Epipharynx with a pair of sensillae immediately behind antero-median setae. Spiracles pale, not very conspicuous. (*Involvulus*.) *hirtus* F.

8 (7). Epipharynx without a pair of sensillae immediately behind antero-median setae. Epipharyngeal rods close to each other, more or less curved. (*Coenorrhinus*.)

9(10). Spiracles pale, not very conspicuous. Sclerotisation of frontal piece distinct but pale, limited behind by a simple curved line, weakly emarginate in middle . . . . . *germanicus* Hbst.

10 (9). Spiracles dark, conspicuous. Sclerotisation of maxillae and frontal piece dark, the latter obliquely truncate at sides, truncate posteriorly in middle and with a deep incision along endocarina. *pauxillus* Germ.

11 (4). Third paramedian pair of prothoracic bristles nearly twice as distant as first pair. Distal ventral sensillae of prementum about as distant as distal ventral setae. Body robust. Proximal spine of ventral surface of maxillary lobe just behind the tooth, so that no emargination exists (see fig. 55), tooth small.

12(15). Spiracles not very conspicuous, pale. Asperities of pronotum very conspicuous. Paramedian anterior setae of frontal piece more caudad than the next seta, at about same level as anterior sensillae. (*Haplorrhynchites*.)

13(14). Smaller seta present much caudad and laterad of posterior sensillae

of frontal piece, behind margin of strongly sclerotised area (almost half-way between sensilla and sublateral row of small setae). *pubescens* F.

14(13). No smaller seta present, caudad and laterad of posterior sensilla of frontal piece . . . . . *coeruleus* Deg.

15(12). Spiracles well sclerotised, conspicuous. Asperities of pronotum not very conspicuous. Paramedian anterior setae of frontal piece scarcely more caudad than the next seta, much before level of anterior sensillae. Smaller seta laterad of posterior sensilla, on margin of strongly sclerotised area. (*Merrhynchites*) . . . *bicolor* F.

16 (1). Head (in full-grown larva) much wider in front than towards middle, with front angles prominent and strongly sclerotised and sides converging from behind front angles (fig. 6). Each half of posterior tergal folds with 6–8 long bristles.* Maxillary tooth absent. Ligula feebly bilobed (fig. 69). (*Rhynchites* s.str.)

17(18). 3 antero-lateral setae of epipharynx. Distal ventral sensillae of labium as distant as distal ventral setae. Last segment of maxillary palpi as long as wide . . . . . *velatus* Lec.

18(17). 2 antero-lateral setae of epipharynx. Distal ventral sensillae of prementum distinctly nearer to each other than distal ventral setae. Last segment of maxillary palpi in full-grown larva somewhat longer than wide. (Figs. 6, 69, 98, 104.) . . . . . *auratus* Scop.

Species of Bycticus.

1 (2). The exterior pair of frontal foveae extends scarcely farther forward than the interior pair, and is not distinctly defined posteriorly, so that it passes rugosely into the posterior part of front and appears oblong, the lateral boundaries of the interior impression somewhat converging behind. 2nd spine of dorsal row of maxillary mala nearer to 3rd than to 1st spine, 3rd spine not in a straight line with 1st and 4th (fig. 75) . . . . . *populi* L.

2 (1). The exterior part of frontal foveae extends farther forward than the interior pair and is distinctly defined posteriorly, so that it appears to be circular, the lateral boundaries of the interior impression somewhat diverging behind. 2nd spine of dorsal row of maxillae nearer to 1st than to 3rd ; 1st, 3rd and 4th spines nearly in a straight line (fig. 74). (Figs. 7, 31, 32, 76, 94, 97) . . . . . *betulae* L.

Genera of Attelabini.

1 (4). Each half of posterior tergal folds with 6 long setae. Antero-median setae of epipharynx not markedly nearer to each other than those of labrum.

2 (3). Maxillary stipes with 5–7 long bristles and about 3 sensillae on ventral and exterior surface, each half of prementum and mentum with 6 bristles and 2 sensillae (fig. 58). Ligula subtruncate, not reaching tip of labial palpi, maxillary palpi surpassing mala. Body with numerous very long and conspicuous setae, which, on the abdomen, are the length of about 1 segment. 9th abdominal segment broadly rounded in lateral view. 1 ocellus . . *Himatolabus* (*pubescens* Say).

3 (2). Maxillary stipes with 3 long bristles and 2 sensillae on ventral and exterior surface, each half of prementum and mentum with 4 bristles and 2 sensillae (fig. 73). Ligula evenly rounded, nearly reaching tip of labial palpi, labial and maxillary palpi very stout,

* Not definitely ascertained for *velatus*, since bristles are rubbed off in the specimens at hand, but the exterior 4 bristles take little more than half the width of the space to centre.

(in young larva), maxillary mala surpassing tip of palpi (not only by its bristles), dorsal row of spines of maxillary mala continuous, tip of mala without a distinct notch. 2 ocelli.
Xestolabus (*corvinus* Gyll.).

4 (1). Each half of posterior tergal folds with 3–4 long bristles (fig. 100). Antero-median setae of epipharynx twice as near as those of labrum (fig. 34). Maxillary stipes with 3 long bristles and 3–5 sensillae (bristles on mala and 1 small bristle and 1 sensilla near edge and base of maxillary mala, which are missing in the slides of the 2 foregoing species, have not been counted) on ventral and exterior surface, each half of prementum and mentum with 3–4 bristles and 2 sensillae (fig. 57). Ligula subtruncate, not reaching tip of labial palpi, labial and maxillary palpi moderately stout, the latter surpassing tip of maxillary mala, the tip of mala divided by a very distinct notch, so that the apical row of spines is subinterrupted . . . . . *Attelabus*.

Species of Attelabus.

1 (4). Bristles of body longer, the lateral ones partly as long as one segment.
2 (3). 9th abdominal segment strongly prominent, its two transverse folds very distinct. Bristles longer. (*Homoeolabus*) . . . *analis* Ill.
3 (2). 9th abdominal segment broadly rounded, the two transverse folds scarcely defined. Bristles (fig. 93) shorter. First-stage larvae with large sclerotised appendix to submentum (fig. 81). Front part of pronotum with small, distinct sclerite, which is more shiny than the posterior part. 3 ocelli. Dorsal setae of ligula much less distant from each other than ventral setae. (*Attelabus* s.str.) . *nitens* Scop.
4 (1). Bristles of body shorter, less than half the length of one abdominal segment. 9th abdominal segment broadly rounded, not very prominent. Front part of pronotum without a distinct sclerite, duller than posterior part. (*Synolabus*) . . . . . *nigripes* Lec.

Genera and species of Apoderini.

1 (2). Labium (exclusive of palpi and ligula) as long as wide. Head-capsule distinctly longer than wide, feebly narrowed behind, widest nearly in the middle of the free part, brownish-white, with a darker, suffused spot on each side. Abdominal segments very humped dorsally (in full-grown larvae), 9th segment obtusely pointed, its hump as long as wide in lateral view (fig. 103). Basal segment of maxillary palpi as long as wide. Inner part of maxillary lobe with 3 setae at apex (and 2 thinner ones quite at base), outer part with about 8, these rows rather far apart, the outer one scarcely broader than the inner one, a little more prominent (fig. 65). Ligula nearly twice as wide as one labial palpus. Epipharyngeal rods not reaching front margin of labrum, the latter not trilobed, the outermost bristle of labrum almost level with the next . . . *Hoplapoderus* (*gemmatus* Thunb.).
2 (1). Labium longer than wide. Head-capsule not or only slightly longer than wide. (Inner part of maxillary lobe with 4 or more strong setae, outer part with about 10, the rows scarcely separated. Ligula about as broad as one labial palpus, these latter separated by scarcely their own width (fig. 64). Epipharyngeal rods reaching front margin of labrum, though much less sclerotised there, front margin curved inward at this point, the median part mostly projecting, so that the labrum becomes trilobed (fig. 33). Outermost bristle of labrum much posterior to the next.)* *Apoderus* . . . . . 3.

* Characters in ( ) not known in *Apoderus sissu*.

3 (6). First antennal segment distinct (fig. 19).

4 (5). Basal segment of maxillary palpi as long as wide. Apical segments of maxillary and labial palpi twice as long as wide (fig. 64). Spine of maxillary lobe very pointed. Head feebly narrowed behind, widest nearly in the middle of the free part, brownish-white, microsculpture mainly transverse. 9th abdominal segment moderately humped, the dorsal and apical curvature meeting (in side view) in a (rounded) obtuse angle (fig. 101). (Figs. 25, 105.) (*Leptapoderus.*) *quadripunctatus* Gyll.

[5 * (4). Basal segment of maxillary palpi transverse. Apical segments of maxillary and labial palpi less than twice as long as wide. 9th abdominal segment apparently even flatter than in *quadripunctatus.* (*Strigapoderus*) . . . . . *sissu* Mshl.]

6 (3). First antennal segment indistinct or wanting (fig. 20). Head more strongly narrowed behind, widest at about $\frac{1}{3}$ of its length, generally brown with broad white lines, microsculpture mainly isodiametric. 9th abdominal segment strongly humped, the dorsal and apical curvature meeting in a (rounded) sharp angle (fig. 102). Inner row of spines of maxillary lobe short, consisting of about 4–6 stout and 3 thinner spines (fig. 77). Basal segment of maxillary palpi transverse, apical segments of maxillary and labial palpi twice as long as wide (in full-grown larvae). (Figs. 26, 33, 83, 92, 96.) (*Apoderus* s.str.) . . . . . *coryli* L.

Genera of Apionini.

1 (2). 2–4(–5) antero-median spines of epipharynx (fig. 43). Mostly 1 pair of epipharyngeal spines. 1 + 7 pairs of spiracles, thoracic spiracles uni- or bi-cameral . . . . . *Apion.*

2 (1). 2 antero-median spines of epipharynx. 2 pairs of epipharyngeal spines (the second setiform but very distinct). 1 + 6 pairs of spiracles, thoracic spiracles unicameral. Endocarina indistinct. Antennae very slender. Labrum with 4 pairs of bristles. 2 antero-lateral setae of epipharynx. Labial palpi nearly as long as wide, sclerome of prementum with a short basal stalk, ventral bristles of prementum nearly as far apart as inner basal end of labial palpi. Pedal discs indistinct. Maxillae as in *Apion* . . . *Podapion* (*gallicola* Riley).

Species of Apion.

1(14). Epipharynx with 2 antero-lateral setae (1). Labrum with 1 (fig. 16) or 3 pairs of bristles.

2 (9). Labrum with 1 pair of bristles, epipharyngeal spine similar to antero-lateral setae. Ventral bristles of prementum much nearer together than palpi.

3 (8). Thoracic spiracle bicameral. Endocarina missing or extremely short, present just on tip of frontal piece, frontal sutures very distinct. Head short, distinctly wider than long. Body robust, no pedal discs (*Exapion*).

4 (7). Head widest at basal third, little narrowed behind, paler, yellowish to yellowish-brown.

5 (6). Head wider, moderately narrowed in front (fig. 9), yellowish greyish-brown with some faint longitudinal infuscations. Endocarina indistinct . . . . . *ulicis* Forst.

6 (5). Head narrower, strongly narrowed in front, front half scarcely rounded, reddish-yellow . . . . . *fuscirostre* F.

* Characters in [ ] according to Gardner.

7 (4). Head widest in middle, rather strongly narrowed behind, brown, endocarina distinct though short. (Fig. 16.) . . . *difficile* Herbst.

8 (3). Thoracic spiracle unicameral. Endocarina pale, frontal sutures not very distinct. Head oblong-ellipsoidal, brownish-yellow, as long as wide. (North America) . . . . . *ellipticum* Sm.

9 (2). Labrum with 3 pairs of bristles.

10(13). 3 pairs of labral bristles in normal arrangement (see fig. 15). Endocarina very faint and pale, rather short. Ventral bristles of prementum farther apart than inner basal end of palpi.

11(12). 4 antero-median bristles of epipharynx (as in all the other species except *longirostre*). Thoracic spiracle bicameral. Premental sclerite not pointed at basal end (pointed in all the other species). Mentum with large, rectangular sclerite (without sclerite in all the other species). Frontal sutures rather distinct. Head transversely subquadrate, rather rounded posteriorly, brownish-yellow, wider than long. Left mandible with a broad, blunt tooth on cutting edge. (North America) . . . . . *segnipes* Say.

12(11). 2 antero-median setae of epipharynx. Thoracic spiracle unicameral. Premental sclerite and mentum normal. Frontal sutures not very distinct. Head short ovate, nearly circular, the sides somewhat straight only in front. Left mandible with a small blunt tooth on cutting edge. (*Rhopalapion*) . . . . . *longirostre* Ol.

13(10). Labrum with 3 pairs of bristles arranged in one transverse row. Head on each epicranial half with 3 pale olive-brownish longitudinal stripes. (*Phrissotrichum*) . . . . . *tubiferum* Gyll.*

14 (1). Epipharynx with 3 antero-lateral setae.†

15(16). Labrum with 2 pairs of bristles : 1 big seta above outer margin of epipharyngeal rods, 1 small seta near middle of front margin. Endocarina long, pale. Frontal sutures not very distinct. Head short ovate, brownish-yellow, little wider than long. Ventral bristles of prementum about as far apart as inner basal end of palpi. Thoracic spiracle unicameral. (North America) . . *subornatum* Fall.

16(15). Labrum with 4 pairs of bristles,‡ arranged as in fig. 15. Endocarina long, though sometimes pale. Pedal discs distinct, though often pale.

17(20). Antennae stout, conical, not quite twice as long as wide (fig. 22). Head circular behind, somewhat narrowed in front (short ovate), brownish-yellow. Endocarina distinct. Clypeus much wider than labrum. Epipharyngeal spine stout. Ventral bristles of prementum much nearer together than palpi (fig. 59).

18(19). Prementum at base with a subparallel stalk (fig. 59). Frontal sutures not distinct. Cornea indistinct. Thoracic spiracle bicameral. (Fig. 22.) (*Ceratapion*) . . . . . *onopordi* Kby.

19(18). Prementum simply pointed. Frontal piece almost as long as wide. Thoracic spiracle unicameral. (*Diplapion*) . . . . *stolidum* Germ.

20(17). Antennae slender, more than twice as long as wide (figs. 15, 23).

21(30). Head oblong-ellipsoidal, as long as or a trifle longer than wide (fig. 10). Endocarina distinct, frontal piece almost as long as wide. Cornea very distinct.

22(25). Mandibles without a tooth or strong extension on cutting edge. Thoracic spiracle unicameral (see fig. 84). Ventral bristles of premen-

* According to Falcoz.

† One of them may be missing on one side, in one slide of *A. violaceum* 4 antero-lateral setae have been found on one side.

‡ *A. columbinum* has, according to Grandi, only 3 pairs, but arranged as in the other species mentioned under 16.

tum much nearer together than palpi (see fig. 59). Paramedian setae of labrum nearer together than 4 antero-median setae, standing between inner and outer pair. Head pale reddish-yellow. (*Perapion*).

23(24). Clypeus scarcely broader than labrum (fig. 10) . . *curtirostre* Germ.*

24(23). Clypeus normal, much wider than labrum (see figs. 15, 16) *hydrolapathi* Marsh.

25(22). Left mandible with a tooth (as in fig. 45) or strong extension on cutting edge. Ventral setae of prementum nearly as close together as inner basal end of palpi.*

26(29). Paramedian setae of labrum closer together than 4 antero-median setae of epipharynx, standing between inner and outer pair.

27(28). Thoracic spiracle unicameral (see fig. 84). Left mandible with a strong, rounded dilatation, which is sloping and not at all prominent towards apex. Head light brown to brown, each epicranial half with a suffused dark spot. (*Protapion*) . *assimile* Kby. or *apricans* Herbst.

28(27). Thoracic spiracle bicameral. Left mandible with a rather distinct and prominent (towards apex) though rounded tooth on cutting edge (see fig. 45). Head pale reddish-brown. (*Aspidapion*) *aeneum* F.

29(26). Paramedian setae of labrum further apart than 4 antero-median setae of epipharynx, placed outside outer pair. Left mandible with the tooth somewhat prominent towards apex (though broadly rounded). Head pale brownish-yellow to brownish-yellow. Thoracic spiracle bicameral. (*Ceratapion*) . . . . . *carduorum* Kby.

30(21). Head wider than long (measured to front margin of frontal piece), not ellipsoidal. Clypeus much wider than labrum (except in *A. miniatum*).

31(42). Ventral bristles of prementum about as far apart as inner basal end of palpi (not checked in *rufirostre*) (fig. 61).

32(35). Head brown to dark brown. Pedal discs conspicuous, brown.

33(34). Antero-lateral setae and epipharyngeal spines rather slender. Endocarina well sclerotised. Exterior frontal seta apart from front callus. Thoracic spiracle unicameral. (*Pseudapion*) . . . . *rufirostre* F.

34(33). Antero-lateral setae and epipharyngeal spine stout. (*Cyanapion.*) (After descr. and figs. by Grandi) . . . . . *columbinum* Germ.

35(32). Head brownish-yellow. Pedal discs pale, inconspicuous in entire larva, conspicuous in slides owing to smooth structure. Left mandible with a strong, rounded dilatation, which is oblique and not prominent towards apex.

36(39). Exterior frontal seta very near to frontal callus. Cornea distinct.

37(38). Thoracic spiracle bicameral. Head subquadrate-circular. Endocarina strongly sclerotised, long. (*Aspidapion*) . . . *radiolus* Kby.

38(37). Thoracic spiracle unicameral. Head ovate-circular, evenly rounded behind, feebly narrowed in front. Frontal sutures indistinct, endocarina long, but pale, rather inconspicuous. Body very slender. (Fig. 61.) (*Leptapion*) . . . . . *meliloti* Kby.

39(36). Exterior frontal seta far from front callus. Endocarina pale.

40(41). Premental sclerite with a narrow basal stalk. Cornea indistinct. Thoracic spiracle bicameral. (North America) . . . *rostrum* Say.

41(40). Premental sclerite pointed and somewhat produced, but without a subparallel stalk. Cornea distinct. Thoracic spiracle unicameral. (North America) . . . . . *griseum* Sm.

42(31). Ventral bristles of prementum much nearer together than inner basal end of labial palpi (*ononis* ?). Endocarina strongly sclerotised.

* Some specimens of *A. miniatum* with a longer head and without a mandibular tooth can at present only be distinguished from *curtirostre* by their greater size. Similar specimens with a tooth differ from the species under 25 by the closer placed ventral setae of prementum and by the narrow clypeus.

43(50). Head pale, brownish-yellow. Pedal discs pale, inconspicuous in entire larva, conspicuous in slide by smooth structure.
44(47). Exterior frontal seta rather distant from front callus (see fig. 16).
45(46). Cornea distinct. (*Pseudostenapion*) . . . . . *simum* Germ.
46(45). Cornea indistinct. Thoracic spiracle bicameral. (*Pseudoperapion*) *brevirostre* Hbst.
47(44). Exterior frontal seta close to front callus (fig. 15). Head short ovate (fig. 11). Cornea distinct. Thoracic spiracle unicameral (fig. 84).
48(49). Clypeus much wider than labrum, sides subparallel (fig. 15). Mandibles without a tooth on the cutting edge. Head almost circular, sides only somewhat straight in front. (Figs. 11, 43, 84.) (*Perapion*) *violaceum* Kby.
49(48). Clypeus not much wider than labrum, with sides straight and converging (see fig. 10). Left mandible with (fig. 45) or without a distinct tooth on cutting edge, tip very dark. Head somewhat more ovate. (*Erythrapion*) . . . . . *miniatum* Germ.
50(43). Head darker, light brown to dark brown, subquadrate (*ononis*?). Cornea indistinct. Exterior frontal seta close to front callus. Pedal discs more or less brown.
51(52). Antennae moderately slender. (*Holotrichapion*) . . . . *ononis* Kby.
52(51). Antennae very slender, 3–4 times as long as wide (fig. 23). Thoracic spiracle unicameral. (Fig. 2.) (*Leptapion*) . . . . . *loti* Kby.

Species of Nanophyes.

1 (2). Last segment of palpi of same length, last segment of maxillary palpi somewhat longer than first segment. Head ovate, front margin of frontal piece darker only at front callus. Anterior transverse folds of abdominal segments 1–8 feebly bilobed, posterior folds of segments 1–3 feebly bilobed, these lobes much farther apart than those of anterior fold, posterior fold of the following segments not bilobed, but not less protuberant towards sides, outside with another slight hump, which is particularly distinct on segments 1–3. Maxillary mala narrower than basal segment of palpi, dorsal row consisting of 6 rather slender bristles . . . . . *terminaliae* Mshl.
2 (1). Last segment of labial palpi $1\frac{1}{2}$ times as long as last segment of maxillary palpi, last segment of maxillary palpi somewhat shorter than first segment (fig. 72). Head short-ovate, front margin of frontal piece with sclerotisation twice as wide as front callus, epicranial halves somewhat sclerotised behind antennae. Anterior and posterior transverse folds of abdomen simple. Maxillary mala rounded, somewhat wider than basal segment of palpus, dorsal row consisting of 6 strong and rather stout spines. (Fig. 44.) *robustus* Pic.

Genera of Mecininae.

1 (4). No paired sclerite on prosternum in front of and between pedal lobes. Anus terminal, small, a simple, transverse cleft (*Mecinus*?). Spiracles unicameral (fig. 87) (except sometimes in prothorax and probably in first-stage larvae). Basal segment of maxillary palpi complete or incomplete (figs. 66–68, 70–71), if complete generally much shorter than second segment or at least less than half as long on inner side as on outer side, very seldom as in *Miarus*.
2 (3). Maxillary palpi very short, not surpassing tip of mala, basal segment incomplete, mala forming an obtuse but prominent angle with stipes, stipes slender, not much dilated from base to distal exterior seta, dorsal

row on mala consisting of short setae, exterior margins of stipites scarcely converging towards tip (fig. 71). Labial palpi 1-segmented. *Mecinus* (*heydeni* Wenck.).

(2). Maxillary palpi surpassing tip of mala, basal segment complete or incomplete, stipes stout, strongly and evenly dilated from base to distal exterior bristle, rounded towards mala, exterior margins of stipites strongly converging towards tip (figs. 66–68). Labial palpi 1- or indistinctly 2-segmented. Endocarina distinct. Pedal lobes very well developed . . . . . *Gymnetron.*

4 (1). Paired sclerome on prosternum in front of and between pedal lobes present (fig. 90). Anus X-shaped, terminal. Spiracles bicameral (fig. 86). Basal segment of maxillary palpi complete, not shorter than second segment, much more than half as long on inner as on outer side (fig. 62). 2–3 basal setae of dorsal row of mala much more prominent than the following bristles. Palpi much surpassing tip of mala (basal segment about reaching the latter), stipites strongly and evenly dilated and converging as in *Gymnetron*, angle between mala and stipes more rounded, not prominent. Labial palpi rather distinctly 2-segmented (figs. 79, 80) . . . . . *Miarus.*

Species of Gymnetron.

1 (6). Basal segment of maxillary palpi incomplete on interior side (fig. 67). Labial palpi 1-segmented without suggestion of the basal segment. (Subgenus *Gymnetron* s.str.)

2 (5). Head yellowish-grey-brown, skin-asperities and pedal discs pale. Labrum free, one (unpaired) median apical seta of labrum, 4 antero-median setae of epipharynx. Air-tubes of abdominal spiracles with 3–6 constrictions.

3 (4). Epipharyngeal rods distinct. . . . . *beccabungae* L.

4 (3). Epipharyngeal rods not distinct. Posterior transverse fold of abdominal segments with a rather low unpaired fleshy knob. . . *anagallis* Mshl.

5 (2). Head and skin-asperities dark brown, pedal discs brown. Labrum fused with clypeus, epipharyngeal rods absent, 2 antero-median setae of epipharynx. Posterior transverse folds of abdominal segments with a rather low unpaired fleshy knob. Air-tubes of abdominal spiracles with 3–4 constrictions. (Fig. 67) . . . . *villosulum* Gyll.

6 (1). Basal segment of maxillary palpi complete on interior side though sometimes much shorter than on exterior side (figs. 66, 68, 70). Labial palpi with a more or less distinct suggestion of the basal segment. Skin-asperities and pedal discs pale. (Subgenus *Rhinusa*.)

7 (8). Basal segment of maxillary palpi oblique, much shorter on interior than exterior side (fig. 70). Labrum fused with clypeus (fig. 40), epipharyngeal rods missing, 2 antero-median setae of epipharynx (fig. 41). Head, pedal discs and skin-asperities pale. Air-tubes of abdominal spiracles with two constrictions. . . . . *linariae* Panz.

8 (7). Basal segment of maxillary palpi cylindrical, not shorter at interior side. Labrum free, epipharyngeal rods present. Air-tubes of abdominal spiracles with 3–5 constrictions.

9(10). Head brown to dark brown. Posterior fold of abdominal segments simple, without fleshy knob. (Figs. 1, 66, 87) . . *antirrhini* Payk.

10 (9). Head brownish-yellow.

11(12). Frontal piece smooth. Basal bristle of maxillary mala somewhat longer than the following bristles, but placed farther back and thus not more prominent (fig. 68). Posterior folds of abdominal segments with an unpaired fleshy knob in middle. (Figs. 12, 38, 39) . . . . . *collinum* Gyll.

12(11). Frontal piece remotely and coarsely granulate. 2–3 basal bristles of maxillary mala more prominent than the following . . *netum* Germ.?

Species of Miarus.

1 (2). Head (fig. 4) brown to dark brown, pedal discs, skin-asperities and sclerites of pronotum and prosternum pale. Labial palpi longer than wide, 2nd segment distinctly longer than wide, basal segment rather well defined (fig. 80) . . . . . *graminis* Gyll.

2 (1). Head piceous black, pedal discs, skin-asperities and sclerites of pronotum and prosternum (fig. 90) brown. Labial palpi as long as wide, 2nd segment as long as wide, basal segment not well defined (figs. 62, 79). (Fig. 86) . . . . . *campanulae* L.

Genera of Rhynchaeninae.

1 (2). Head much narrowed behind, much narrower at the end of the lateral processes than near middle. Frontal sutures meeting endocarina a short distance before occipital foramen. Body more or less slender (rather broad in first-stage larvae, which may be distinguished from older larvae of *Rhamphus* by the lack of the prothoracic shields). Skin-asperities mainly blunt granules, specially near middle of dorsal surface. Epipharyngeal rods short and stout. 3 antero-lateral setae of epipharynx (fig. 49). (Fig. 48) . . . . . *Rhynchaenus*.

2 (1). Sides of head feebly emarginate behind middle, head not or scarcely narrower at the end of the lateral processes than near middle (fig. 14). Frontal sutures meeting endocarina at occipital foramen. Body very broad, short and flat. All skin-asperities spine-shaped. Epipharyngeal rods rather slender; 2 antero-lateral setae of epipharynx (fig. 51). Antennae egg-shaped. Spiracles bicameral. (Figs. 46, 50) . . . . . *Rhamphus* (*pulicarius* Hbst.).

Species of Rhynchaenus.

1(10). Body more slender, cross-section subcircular, abdominal segments 1–7 convex dorsally, 10th abdominal segment subconical, truncate at tip. Skin-asperities not coalescing into sclerotised dark patches (dark patches present only on prothorax, and sometimes pedal discs and 10th abdominal segment dark). Spiracles bicameral. Antero-median and antero-lateral setae of epipharynx little curved.

2 (7). Clypeus without a tubercle. (*Rhynchaenus* s.str.)

3 (4). Epicranial halves brownish-yellow. Skin-asperities pale. Body very slender . . . . . *quercus* L.

4 (3). Epicranial halves brown to brownish-black, sclerites of prothorax and a ring-shaped sclerite surrounding the 10th abdominal segment brown. Skin-asperities dark. Body moderately stout.

5 (6). Pedal discs and sclerites of prothorax yellowish-brown to brown. (Figs. 47–49, 63) . . . . . *saltator* Fourc. (*alni* auct.).

6 (5) Pedal discs pale, sclerites of prothorax dark brown . . . *pilosus* F.?

7 (2). Clypeus with a sclerotised tubercle at each side.

8 (9). Head, sclerites of prothorax, pedal discs(?) and the ring-shaped sclerite of the 10th abdominal segment almost black. Body slender. Skin-asperities dark . . . . . *avellanae* Don.?

9 (8). Skin-asperities pale. Head and sclerites of pronotum brown, pedal discs and 10th abdominal segment not sclerotised. Body very slender. (*Euthoron*) . . . . . *fagi* L.

10 (1). Body more robust and depressed, cross-section strongly transverse, abdominal segments 1–7 flattened dorsally and ventrally, 10th

abdominal segment evenly rounded. Skin-asperities on dorsal and ventral surfaces coalescing into sclerotised, dark patches (except in first stage). Spiracles unicameral (except perhaps in first stage). Antero-median and generally 2 interior antero-lateral setae of epipharynx strongly recurved. (Fig. 91.) (*Isochnus*). . . . *populi* F.

List of Material Studied and Notes.

Abbreviations : B.M. British Museum (Natural History).—coll. E. collection van Emden.—dupl. duplicates.—I. adult.—L. larva.—M.D. Deutsches Entomologisches Institut, Berlin-Dahlem.—M.K. Universitetets Zoologisk Museum, Copenhagen.—M.W. U.S. National Museum, Washington.—num. numerous.—P. pupa.—pres. presented—vend. vendidit.

Literature : Only those papers are quoted which are not found in the bibliographical works by Rupertsberger, Beutenmüller and Wade, and seem also to be important for the subject of this paper.

Belus semipunctatus F. 1 L. (in poor condition), 1 P., 1 I., Stanthorpe, Queensland, ix.1935, H. Jarvis leg. det. ded., coll. E. no. 1820—*sp.* 2 L. (1 on slide : figs. 5, 29, 30, 52), same data, coll. E. no. 1821. 1 L. pres. to M.W.— *sp.* 3 L. (1 on slide : fig. 18), 1 P., same data, coll. E. no. 1822, figs. 88, 106; this specimen pres. to B.M.

Allocorrhynus slossoni Schaeff. 10 L. (1 on slide), 1 I., Homestead, Florida, 25.ii.1919, Schwarz and Barber, ex ♂ flowers of Zamia, M.W., Hopk. 10630^{c}.—4 L., 5 I., same data.

Rhynchites (*Lasiorrhynchites*, *Coccygorrhynchites*) *sericeus* Hbst. 1 L. (on slide), Hosterwitz, nr. Dresden, 31.viii.1935, in leaf-roll of *Attelabus nitens*, v. Emden leg., coll. E. no. 1882 (see Zavadsky, 1924, *Uměni zobonosek, Hlidka*; Prell, 1926, *Zool. Anz.* **65** : 281–288; Zavadsky, 1931, *Zool. Anz.* **93** : 102–108).—(*Involvulus*) *cupreus* L. 6 L. (1 on slide), Naumburg a.S., in fruits of *Prunus*, O. Jancke leg. det. ded., coll. E. no. 1719, 1 L. pres. to B.M. (see Jancke, *Z. angew. Ent.* **21** : 24–64).—(*Involvulus*) *hirtus* F. 7 L. (1 on slide), Glen Echo, Md., ix.1930, Bridwell leg., in flower-buds of *Silphium trifoliatum*, stem partly cut by adults, M.W.; *hirtus* F.? v. E. det. 1 slide, dissected head "*Rhynchites sp.*" Bridwell leg. 30.viii.1920, no locality, M.W.—(*Coenorrhinus*) *germanicus* Herbst. 19 L. (2 on slides), Wye, Ashford, Kent, bred on strawberry, W. S. Rolfe, leg. det. ded., B.M.—(*Coenorrhinus*) *pauxillus* Germ. 18 L. (on slides, 4 placed in alcohol), Langenweddingen, nr. Magdeburg, vii.1934, noxious on *Pirus malus*, Reg.-R. Dr. H. Thiem (Biologische Reichsanstalt für Land- und Forstwirtschaft, Berlin-Dahlem), leg. det. ded. (see Thiem, 1937, *Arb. phys. angew. Ent.* **4** : 1).—(*Haplorrhynchites*) *pubescens* F. 7 L. (6 L. on 9 slides), Schoenebeck a. E., 2.viii.1920, C. Urban leg. det. ded. (see Urban, 1930, *Ent. Blätt.* **26** : 176–179) (2 L. on 4 slides pres. to B.M., 1 L. on 2 slides pres. to M.W.), all larvae from roots of *Thalictrum flavum*.—(*Haplorrhynchites*) *coeruleus* DeG. 9 L. (1 head, 1 L. on slides), Wye, Ashford, Kent, bred on apple-tree, W. S. Rolfe, leg. det. ded., B.M.—(*Merrhynchites*) *bicolor* F. 2 L. (1 head on slide), Medford, Oregon, 16.x.1916, in fruit of *Rosa rubiginosa*, M.W.—(*Rhynchites* s.str.) *velatus* Lec. 2 L. (1 head on slide), Palm Springs, California, 15.v.1914 from *Prunus eriogynii*, M.W.—(*Rhynchites* s.str.) *auratus* Scop. 18 L. (5 L. on slides), 1 I., Meissen in Sachsen, 3.viii.1936 (preserved between 5 August and October 1936), in fruits of *Prunus spinosa* (in the kernels), H. Wiessner leg. det. ded. (LL., 2 L. on slides pres. to B.M., 3 L. pres. to M.W.) (see Gross-Heim, 1925, *La Déf. des Plantes, Leningr.* **2** : 77, f. 3).—*bacchus* L., *aequatus* L., *pauxillus* Germ., see Gross-Heim, *loc. cit.* pp. 77–78, f. 2, 4A–C.—*ruber* Frm., see Silvestri, 1912, *Boll. Lab. Zool. gen. agr. Portici* **6** : 151–170. According to Gross-Heim, *Rh. bacchus* presents the same form of head as *Coenorrhinus*, etc., not as *Rhynchites* s.str., to which it belongs (very close to *auratus*). Possibly no full-grown larvae of this species were available. In *Rh. ruber* the head is slightly narrowed between

front margin and centre, but not nearly so much as in *Rhynchites* s.str. According to Silvestri's drawings, *ruber* (and thus very probably *aequatus* also) seems to be most similar to *pubescens* and *bicolor* in the larval stage, which would agree with the systematic relationship of the adults. The other species described cannot be compared adequately with the material at hand.

Byctiscus populi L. 40 L. (7 L. prepared dry, 2 on slide), collected Hosterwitz, nr. Dresden, 3.vi.1935 (preserved in small numbers each fortnight), in cigar-shaped leaf-rolls on *Populus tremula*, coll. E. no. 1825, dupl. pres. to B.M., M.W., M.D. 2 L. Brickett Wood, Herts, 16.vi.1930, H. Donisthorpe leg., B.M.—*betulae* L. 16 L. (4 L. prepared dry, 4 on 3 slides), nr. Dresden, in cigar-shaped leaf-rolls constructed from several leaves on *Salix*, H. Madle leg., coll. E. no. 1826, dupl. pres. to B.M., M.W., M.D.; 1 head on slide, Birkenwerder, viii.1923, C. Urban leg. et ded., coll. E.; 1 L. on slide, Europe, M.W.—Apical and inner row of dorsal surface of maxillary mala consisting of 4 setae each. Each leaf-roll in both the species contains several eggs and later on several larvae. The leaf-rolls are made without cutting the leaf; those of *populi* consist of a single leaf (almost always) and are more cylindrical than those of *B. betulae*. The structure of the pronotum of *B. betulae* has been described by Gross-Heim, 1925, *La Déf. des Plantes, Leningr.* **2** : 77, f. 4 D.

Eugnamptus hirsutus Voss, 3 L. (1 on slide), 1 P., Sumatra : Moeara Laboeh, xii.1929, mining in *Thea*-leaves, Dr. S. Leefmans and Dr. P. van der Goot ded. B.M. (see Leefmans, 1930, *Arch. Theecultuur Ned. Indie* **3** : 143–151, 8 fig.).

Deporaus betulae L. 5 L. (1 on slide) Schönebeck a. Elbe, viii.1917, C. Urban, leg. det. ded., coll. E. no. 1234; 6 L. Schönebeck a. Elbe, C. Urban leg. det. ded., coll. E. no. 1463; 2 slides, Saalfeld i. Thüringen, vi.1927, C. Urban leg. det. ded., coll. E.; 1 slide, skin of larva, Birkenwerder, viii.1923, C. Urban leg. det. ded., coll. E.; 40 L. (9 L. preserved dry, 4 L. on 2 slides), Hosterwitz b. Dresden, vi.1935 (preserved in small numbers each fortnight), in funnel-shaped leaf-rolls on *Carpinus* and *Fagus*, coll. E. no. 1827, dupl. pres. to M.W., M.D., B.M.; 2 L. Hampstead Heath, London, in brown coiled leaves of birch, B.M.—The larvae are most easily recognised by the long bifurcate endocarina and the prominent spiracles. They live in the funnel-shaped leaf-rolls on different trees. Near Dresden immense numbers of these rolls were found, specially on hornbeam (*Carpinus betulus*). These leaf-rolls of *Deporaus* are characterised by the transverse curved line of incision and the unfolded condition of the rolled part of the leaf. The larva has not previously been described adequately, whereas the method used in constructing the leaf-roll has repeatedly been described (see Prell, 1925, *Z. Morph. Oekol. Tiere* **3** : 685–703; the biological synopsis on p. 702 is particularly important, sections A and B might perhaps be defined better by the unfolded or folded condition of the rolled part of the leaf).

Dicranognathus nebulosus Redtb. 1 L., U.P., India, Mussoorie, J. C. M. Gardner pres. to B.M. (1937–121) (see Gardner, 1934, *Ind. Forest Rec.*, (*Ent.*) **20** (2) : 3, 7, pl. 1, f. 1–5).

Himatolabus pubescens Say. 2 L. (1st- and 2nd-stage? 1st-stage L. on slide), Conduit Road, nr. Plummers Isl., Md., 2.viii.1916, from rolls on hazelnut, Schwarz and Barber, M.W.; 1 unidentified slide, 1st-stage larva, Nogales, Arizona, 1.ii.1935, in case of leaf of *Quercus oblongifolia*, L. H. Weld ded. M.W.—The latter slide differs only in having 7 long bristles on stipes maxillae instead of 5, as stated in *pubescens*.

Xestolabus corvinus Gyll. 2 L. (1 on slide), 2 I., Costarica, Hamburg Farm, 23.v.1935, aus Blattwickeln an *Spondias mombin* coll. E. no. 2361, Nevermann leg. et ded.—Leaf-rolls pres. to M.D., very similar to those of *A. nitens*.

Attelabus (*Homoeolabus*) *analis* Ill. 1 L. without a head, Natchitoches, La., 28.iii.1923, Pierce and Coad, from leaf-roll on *Quercus nana*, M.W.—(*Attelabus* s.str.) *nitens* Scop. 2 L. (1 on slide), Gundorf nr. Leipzig, iii.1923, on ground amongst refuse, at margin of wood, H. Dietze leg., coll. E. no. 562; 1 L. Schönebeck a. Elbe, 15.viii.1931, Urban leg. det. ded., coll. E. no. 1239; 6 L. (4 L. on slides), 2 P.,

same data, coll. E. no. 1272; numerous L. (2 L. and 1 labium of 1st-stage L. on slides), Hosterwitz, nr. Dresden, vi.1935 (preserved in small numbers each fortnight), in leaf-rolls on oak, coll. E. no. 1829, dupl. pres. to M.W., M.D.; 3 eggs, 3 1st-stage L. in 2 leaf-rolls, same data, 17.viii.1935, coll. E. no. 2015; 4 L. (1st-stage), same data, from 2 leaf-rolls (2 in each), coll. E. no. 2018; 1 L., 1 P., 2 I., Netley Heath, x.1921, K. G. Blair, B.M.; 5 L., Herne, C. Waterhouse, B.M.; 3 L., leaf-rolls, Hildesheim, 1907–342, K. Jordan leg., B.M.—(descr. of larva, see Verhoeff, 1923, *Arch. Naturges.* **89** (A) (1) : 47). The 1st-stage larva of *A. nitens* has a curious sclerotised process on the labium, see fig. 81, which is not found in the other 1st-stage larvae studied, viz. *Himatolabus pubescens* and *Att. bipustulatus*.—(*Synolabus*) *nigripes* Lec. 1 L., 1 P., 2 eggs, Plummers Island, Md., 29.viii.1912, from rolls on *Rhus*, Schwarz and Barber, M.W.—(*Synolabus*) *bipustulatus* F. 11 L. (1 on slide) (1st-stage), 4 eggs, Jacksonville, Florida, 22.v.1934, Durkee leg., in oak leaf-rolls; 1 L. on slide (1st-stage), Texarcana, Arizona, Hunter leg., on *Carpinus carolinensis*. Dorsal setae of ligula somewhat more distant from each other than ventral setae. The characters of *Attelabus* are present in *bipustulatus*, but the 1st-stage larvae cannot be compared with the more or less adult larvae treated in the key on p. 16. On the other hand, the microscopic characters of *analis* and *nigripes* have not been studied. —The leaf-rolls of the Attelabini and Apoderini are very similar; both are constructed only of part of the leaf, which is separated from the base by a more or less straight transverse incision. The adults of both groups fold the distal part of the leaf along the mid rib before rolling it.

Hoplapoderus gemmatus Thunb. 2 L. (1 L. on slide), Dehra Dun, U.P., India, in leaf-rolls on *Sida rhombifolia*, J. C. M. Gardner leg. det. ded., coll. E. no. 1883; 5 L., same data, J. C. M. Gardner pres. to B.M. (see Gardner, 1934, *Indian Forest Rec.*, (*Ent.*) **20** (2) : 7, where are given some notes regarding *H. hystrix* F.).

Apoderus (*Leptapoderus*) *quadripunctatus* Gyll. 9 L. (2 L. prepared dry, 4 on 4 slides), 3 P., 4 I., Tjipetir, nr. Tjibadak, Java, from leaf-rolls on *Derris elliptica*, Franssen leg. (see van der Vecht, 1936, *Ent. Meded. Nederl. Indie* **2** : 9–12), coll. E. no. 2311, dupl. pres. to B.M., M.W. *Apoderus clavatus* Pasc. is synonymous with *quadripunctatus* Gyll. (kindly confirmed by Herrn E. Voss).—(*Strigapoderus*) *sissu* Mshl. (see Gardner, 1934, *Indian Forest Rec.*, (*Ent.*) **20** (2) : 7).—(s.str.) *coryli* L. 2 L. (on slides) viii.1910, Schönebeck a. Elbe, Urban leg. det. ded., coll. E. no. 1251; 8 L. (2 L. prepared dry, 6 on slides), 1935, Hosterwitz, nr. Dresden, from leaf-rolls on hazel, coll. E. no. 1828, dupl. in B.M., M.W.

Cylas formicarius F. 14 L. (2 L. on slides), 3 P., 4 I., Townsville, Queensland, in sweet potatoes, F. H. Taylor, 23.xi.1927, B.M. 2 L., 1 I., same data, coll. E. no. 2314.

Apion (*Exapion*) *ulicis* Först. num. LL. (3 on slides), PP., 25.vi.1927, Harpenden, W. M. Davies, B.M., dupl. pres. to M.W.—(*Exapion*) *fuscirostre* F., 7 L. (1 L. on slide), 3 P., Blaavand, 6.viii.1910, E. Olsew leg., in *Sarothamnus*-seeds, M.K.—(*Exapion*) *difficile* Hbst. 6 L. (3 on slides), Finsterbergen in Thüringen, 2.viii.1933, Urban leg. det. ded., coll. E. no. 1233, dupl. in B.M., M.W.—*ellipticum* Sm. 9 L. (1 on slide), 4 P., 1 I., Dallas, Texas, 18.iv.1907, C. E. Hood, from root-galls on *Chaerophyllum texanum*, M.W.—*segnipes* Say., 5 L. (1 on slide), 4 P., 4 I., Barcroft, Virginia, U.S., 6.ix.1927, J. C. Bridwell leg., and Pendleton, Virginia, 5.viii.1935, J. S. Yip leg., in seeds of *Tephrosia* (*Cracca*) *virginiana*, L., M.W.—*subornatum* Fall 2 L., 2 P., 2 I., Beeville, Texas, 20.iv.1907, R. A. Cushman, in pods of black chapparal, M.W.—(*Ceratapion*) *onopordi* Kby. 3 L. (on slides), 3 P., Schönebeck a. Elbe, 19.vii.1912, Urban leg. det. ded., from roots of *Onopordon acanthium* L. (see Urban, 1913, *Ent. Blätt.* **9** : 177–179).—(*Diplapion*) *stolidum* Germ. 1 L. (on slide), Esbjerg, Denmark, 3.vii.1928, in *Matricaria inodora*, E. Rosenberg leg. det. ded., coll. E. no. 790.—(*Perapion*) *curtirostre* Germ. 6 L. (1 on slide), 2 P., Münden, K. Jordan leg., B.M.—(*Perapion*) *hydrolapathi* Marsh. 8 L. (3 on slides), Slough, Bucks, from stems of *Rumex obtusifolius*, J. A. Downes leg. et ded., B.M. These larvae have not been bred out, but as *hydrolapathi* is the most common species

obtained from *Rumex obtusifolius* at Slough, the identification is hardly in doubt. The other larvae found are either larger and referred to *miniatum* or like *violaceum* and referred to that species. The characters of the larvae agree fully with those of larvae from which *hydrolapathi* has subsequently been bred out.—(*Protapion*) *assimile* Kby., or *apricans* Hbst. 14 L. (2 on slides), Denmark, 14.vi.1934, from *Trifolium pratense*, P. Bovien leg. det. ded., B.M.—(*Aspidapion*) *aeneum* F. 8 L. (1 on slide), 2 P., 1 I., Dragor, Denmark, 20.vii.1916, from *Malva* sp., E. Rosenberg, M.K.—(*Ceratapion*) *carduorum* Kby. num. L. (2 on slides) Bruges, Gironde, 30.iv.1936, in sprouts of artichoke, Bruneteau leg. det. ded., B.M.; 10 L. Italy, introduced with globe artichokes into U.S. America, v.1937, M.W. (not bred); 11 L. (1 on slide), England, introduced with globe-artichoke stems into U.S.A., 6.iv.1937, M.W.—(*Pseudapion*) *rufirostre* F. 1 L. (on slide) Schönebeck a. Elbe, Urban leg. det. ded., coll. E.—(*Cyanapion*) *columbinum* Germ. (see Grandi, 1932, *Boll. Lab. Ent. Bologna* **5** : 93–98, figs. I–II; 1933, *loc. cit.* **6** : 115–130, f. I–V, t. II–V).—(*Aspidapion*) *radiolus* Kby. 5 L. (1 on slide) and parasites (*Sigalphus* sp.), Hendon, Middlesex, viii.1936, from *Althaea rosea*, K. G. Blair leg. det., B.M. (2 L. pres. to M.W.); 1 L. (mouthparts only, on slide), Schönebeck a. Elbe, 15.vii.1913, Urban leg. det. ded., coll. E.—(*Leptapion*) *meliloti* Kby. 8 L. (3 on slides), Schönebeck, 19.vii.1933, from *Melilotus*, Urban leg. det. ded. (see Urban, 1936, *Ent. Blätt.* **32** : 105–106), coll. E. no. 1241, dupl. pres. to B.M., M.W.—*rostrum* Say. 5 L. (1 on slide), 2 P., 2 I., College Park, Maryland, 21.vii.1928, H. S. McConnell, in pods of *Baptisia tinctoria* (adults in pods of the same plant, Anahuac, Texas, 20.vi.1918), H. C. Hanson, M.W.—*griseum* Sm. 15 L., 2 P., Chihuahua, Mexico, in green string beans, M.W.; 6 L. (1 on slide), 3 P., 4 I., Rosario, Sinaloa, Mexico, in Lima beans, M.W.—(*Pseudostenapion*) *simum* Germ. 1 L. (on slide), Schönebeck a. Elbe, Urban leg. det. ded., coll. E.—(*Pseudoperapion*) *brevirostre* Hbst. 4 L. (on slides), Schönebeck a. Elbe, Urban leg. (see Urban, 1934, *Ent. Blätt.* **30** : 60) det. ded. (1 pres. to B.M.).—(*Perapion*) *violaceum* Kby., 6 L. (on slides), 4 P., Schönebeck a. Elbe, 6.vii.1913, Urban leg. det. ded., 1 slide pres. to B.M. and 1 to M.W.; 1 L., 2 P., Münden, K. Jordan, B.M.—(*Erythrapion*) *miniatum* Germ. 2 L. (2nd and 3rd stages? larger specimen on slide), Slough, Bucks, from stems of *Rumex obtusifolius*, J. A. Downes leg. et ded. B.M. The species has not been bred out, but *miniatum* is the only larger species obtained from *Rumex obt.* at Slough. Later bred specimens were obtained, and some differences recorded (see note p. 19); 1 L. Münden, K. Jordan, B.M.—(*Holotrichapion*) *ononis* Kby., 1 L. (on slide, 1st stage), Schönebeck a. Elbe, Urban leg. det. ded., coll. E.—(*Leptapion*) *loti* Kby., 6 L. (1 on slide), Compton Bay, Isle of Wight, ix.1930, K. G. Blair, B.M. 2 L. pres. to M.W.; 2 L., 1 P., 1 I., Hildesheim, K. Jordan, B.M.; 4 L. on slides, Schönebeck a. Elbe, 1931, Urban leg. (see Urban, 1932, *Ent. Blätt.* **28** : 109–113), det. ded., coll. E.—(*Omphalapion*) *hookeri* Kby. 1 L., 3 P., Amager, Denmark, 29.viii.1915, E. Rosenberg leg., in *Matricaria inodora*, M.K. The single specimen has not been dissected, so that the species could not be dealt with in the key. The head is wider than it is long, strikingly narrowed towards the mouth, and thus rounded triangular, frontal sutures wide, endocarina short but distinct. Head brown, pedal discs light brown.—I have received from Dr. C. Urban two slides containing 2 specimens labelled "Larve des *Apion hookeri* Kby." Both these specimens belong to a species of *Ceuthorrhynchus*, presumably of the *campestris* group, which lives in the same plants. The drawings in Dr. Urban's paper (1914, *Ent. Blätt.* **10** : 229–231) refer also to a species of *Ceuthorrhynchus*, probably to the same slides. On the other hand, Dr. Urban's figures of *Apion onopordi* belong certainly to an *Apion*, and according to the length of the mentum stalk, to *onopordi* (this is stressed in view of Urban's note 1914 : 231).

Podapion gallicola Riley. 2 L. (1 on slide), Warrensburg, N.Y., A. H. Macand, removed from gall on red pine twig, July–Oct. 1929, M.W. (see Böving and Craighead, 1931, *Ent. Amer.* (n.s.) **11** : pl. 120, f. A–D; some of the characters drawn prove to be as stated in my key, p. 17).

Nanophyes terminaliae Mshl. 4 L. (1 on slide), Madras, Ootacamund, from seeds of *Terminalia paniculata*, J. C. M. Gardner ded. (see Gardner, 1934, *Indian Forest Rec.*, (*Ent.*) **20** (2) : 32, t. 4, f. 73–74), B.M.—*robustus* Pic. 7 L. (1 on slide); 2 P., 1 I., G. A. K. Marshall det., Mid-Java, 1919, L. Kalshoven leg. ded., fruit-borer in *Lagerstroemia speciosa*, B.M., 2 L. pres. to Mr. Gardner.

Orobitis cyaneus L. 13 L. (10 on slides), 4 P., 2 I., 19.viii.1918 (part of the larvae on slides dating from 1916), Schönebeck a. Elbe, C. Urban leg. det. ded. (see Urban, 1935, *Ent. Blätt.* **21** : 139–141), coll. E. no. 1271, dupl. pres. to B.M., M.W.—1 L. Schönebeck a. Elbe, ix.1920, Urban leg. det. ded., M.D.

Stenopelmus rufinasus Gyll. 2 L. (1 on slide), Schönebeck a. Elbe, 10.x.1923, C. Urban leg. det. ded., coll. E. no. 1296.—1 L., Horning, xi.1922, H. Donisthorpe leg. ded., on *Azolla*, B.M.

Mecinus heydeni Wenck. 1 L. (on slide), Esbjerg, 26.vii.1928 on *Linaria vulgaris*, E. Rosenberg leg. det. ded., coll. E. no. 789.—I had mounted this specimen long ago; unfortunately the condition of the anus cannot be judged reliably from the slide.

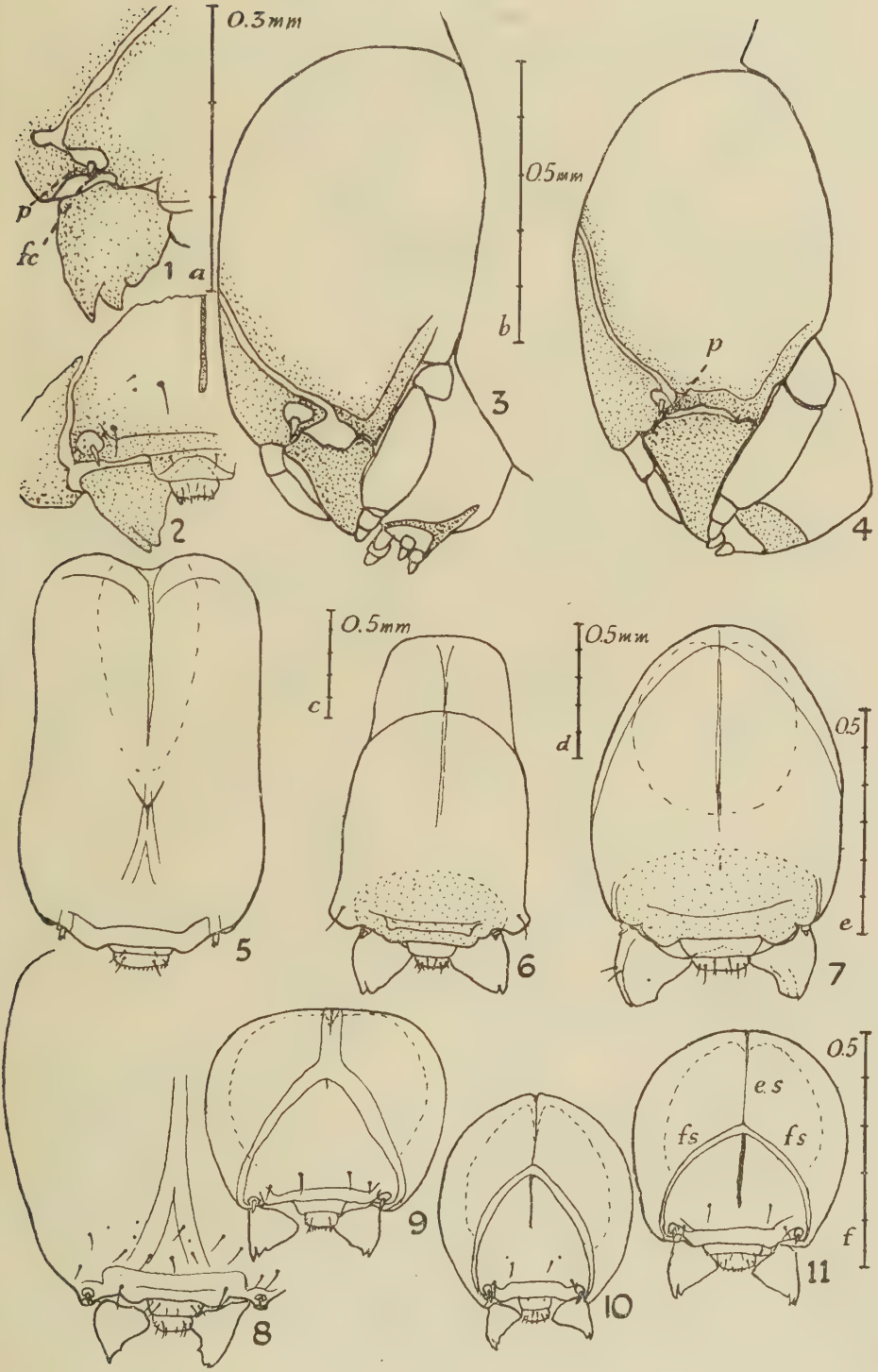
Gymnetron beccabungae L. (*squamicolle* Reitt.) 2 L. (on slides), 3 P., Schönebeck a. Elbe, 9.viii.1914, C. Urban leg. det. ded. (see Urban, 1930, *Ent. Blätt.* **26** : 100–101), from *Veronica scutellata*, coll. E. no. 1291. The presence or absence of fleshy dorsal knobs cannot be determined from my slides. From Mr. E. Rosenberg, of Copenhagen, I received some years ago a single specimen named "*Gymnetron netum* or *pilosum*?" and taken from a stem-gall of *Linaria vulgaris*, Nörsholm, Denmark, 10.ix.1928, coll. E. no. 788. This specimen has the characters of subg. *Gymnetron* s.str., and agrees apparently with *beccabungae*. Since it differs from the species of the subg. *Rhinusa*, at hand, one may perhaps consider it an abnormal record of *beccabungae* in *Linaria* and wait for more material. The head seems to be somewhat darker than in my slides of *beccabungae*, but this is at least partly due to the younger stage.—*anagallis* Mshl. (see Gardner, 1934, *Indian Forest Rec.*, (*Ent.*) **20** (2) : 31–32, t. 2, f. 32–36). It is not stated in the description whether the basal joint of the maxillae is incomplete, but since it is said to be short, and the species lives in a *Veronica*, this may be anticipated. The beetle belongs to the same group as *beccabungae* and *villosulum* (see Marshall, 1933, *Ann. Mag. nat. Hist.* (10) **12** : 570).—*villosulum* Gyll. 19 L. (4 on slides), 7 P., Schönebeck a. Elbe, 2. x., C. Urban leg. det. ded. (see Urban, 1930, *Ent. Blätt.* **26** : 98–99), coll. E. no. 1229, dupl. pres. to B.M., M.W.—(*Rhinusa*) *linariae* Panz. 1 L., 9 larval exuviae (all on slides), 15 P., 4 I., Schönebeck a. Elbe, C. Urban leg. det. ded. (see Urban, 1931, *Ent. Blätt.* **27** : 105–106), coll. E. no. 1228, 1923, 1 slide (3 exuv.) pres. to B.M.—(*Rhinusa*) *antirrhini* Payk. (*noctis* auct.). 21 L. (5 on slides), 15 P., Schönebeck a. Elbe, viii. 1914, C. Urban leg. det. ded. (see Urban, 1930, *Ent. Blätt.* **26** : 101–102), coll. E. no. 1464, dupl. pres. to B.M., M.W.; 3 L., 2 P., galls, 27.viii.1918, on *Linaria vulgaris*, K. G. Blair, B.M.—(*Rhinusa*) *collinum* Gyll. 2 larval exuviae (on slide) 9 L. (1 on slide), 1 P., 1 I., Schönebeck a. Elbe, 21.vii.1930, C. Urban leg. det. ded. (Urban, 1930, *Ent. Blätt.* **26** : 102–104; 1931, *loc. cit.* **27** : 105–106), coll. E. no. 1262, dupl. pres. to B.M.—(*Rhinusa*) *netum* Germ.? 3 L. (only 1 head, on 2 slides), Schönebeck a. Elbe, C. Urban leg. ded., labelled "*Gymnetron antirrhini*, Payk. (*noctis* auct.)." These certainly belong to another species than those to hand. As Dr. Urban formerly bred single specimens of *G. netum* from fruits of *Linaria* containing *G. antirrhini* (see 1930, *Ent. Blätt.* **26** : 102), it may be presumed that the aberrant specimens belong to *netum*. The characters are given in the key, p. 22.

Miarus graminis Gyll. 10 L. (4 on 4 slides), 13 P., Schönebeck, ix.1916, C. Urban leg. det. ded. (1930, *Ent. Blätt.* **26** : 104), coll. E. no. 1295, 1 slide pres. to B.M., 3 L. pres. to M.W.; 6 L., 4 P., same locality, 27.viii.1931, C. Urban leg. det. ded., coll. E. no. 1922, 3 L. pres. to B.M.—*campanulae* L. 8 L. (2 on slides), 1 P., Freiburg a. Unstrut, Thüringen, 9.vii.1922, F. Tornier leg. in fruit-galls on *Campanula rapunculoides*, Alex. Reichert det. et ded., coll. E. no. 461, 3 L., 1 slide pres. to B.M.; 5 L. (2 L. on 3 slides), 3 P., Saalfeld in Thüringen, vi.1917, Urban leg. det. ded.,

coll. E. no. 1284 (see Urban, 1930, *Ent. Blätt.* **26** : 171–173); 3 L. Naumburg a. Saale, 20.vii.1921, W. Speyer leg. det. ded., from *Campanula*, coll. E. no. 1695.

Rhynchaenus (s.str.) *quercus* L. 25 L. (2 on slides), 1 P., Brockenhurst, C. O. Waterhouse and F. W. Terry, B.M.; 1 L. on slide, Schönebeck a. Elbe, 28.v.1921, C. Urban leg. det. ded., coll. E. The characters in the key refer to the larvae taken by Waterhouse as well as to that on the slide received from Dr. Urban. The larvae described by Trägårdh (1910, *Arkiv Zool.* **6** (7) : 15–19, t. 1 and 2), however, belong to another species. Trägårdh does not mention whether he bred the adult. He found only a few full-grown larvae; they may have belonged to *Rhynchaenus avellanae* Donov., or *pilosus* F., both of which occur in Sweden and live on oak. The characters mentioned for *quercus* in Trägårdh's paper will be found in my key under no. 8.—*saltator* Fourc. (*alni* auct.). 4 L. (1 on slide), 3 I., Ealing, vi.1903, C. Waterhouse, B.M.; 2 I., mines, pupal cells, St. Mary's, Scilly Isles, vii.1919, K. G. Blair, B.M. In M.K. there are 4 L., 1 P., in B.M. 5 L., 1 L.—exuv. of "*Orchestes testaceus*" bred by Dr. Verhoeff. These agree fully with those associated in B.M. with adults of *saltator*, except that the colour of the sclerites is in most of them somewhat paler. Dr. Verhoeff was able to state that he had bred the adult, but unfortunately it is not possible to check this. As the characters of the species seem to be rather striking in this genus, it will be necessary to regard these larvae at present as *saltator*. Oldham's description (1928, *Ann. appl. Biol.* **15** : 679) refers to the same species. Grandi (1932, *Boll. Lab. Ent. Bologna* **5** : 98–103, f. III–V) published an excellent description of a species named "*alni* L." The characters are those of *fagi* of my key, and as Grandi stated that the larvae were collected from leaves of beech (*Fagus sylvatica* L.), there can be no doubt that the description actually refers to *fagi*, the only species the larvae of which are found on beech.—*avellanae* Don.? (or *pilosus* F.?) = Trägårdh's *Rh. quercus*, see this species.—*pilosus* F.? 1 L. (head on slide), Brockenhurst, New Forest, 10.vi.1903, "Tineid larva?, off oak, cuts off circular bite of leaf," C. O. Waterhouse. Definitely a larva of a *Rhynchaenus* and related to *quercus* and *saltator* though not identical with either of these species.—(*Euthoron*) *fagi*, L. 9 L. (1 on slide), 8 P., parasite-larvae and pupae, Brockenhurst, New Forest, 10.vi.1903, C. O. Waterhouse, B.M. Descriptions by Trägårdh (1910, *Arkiv Zool.* **6** (7) : 10–15, f. 4–5, t. 1 and 2; 1911, *Ent. Tidskr.* **32** : 74–78, f. 1–4) and Grandi (as *alni*, see that species). As is evident from the drawings, specially from the width of the head, the larvae considered by Trägårdh (1911) as belonging to the 2nd stage are a later form of the 1st stage. The antennae are described by Grandi as formed by a true segment and a main sensilla in addition to other sensillae, *e.g.* two-segmented in the terminology of the present paper, but in my slides of the different species of *Rhynchaenus* the part regarded as the (basal) segment by Grandi does not show anything like an articulation with the frontal piece, so that it can be only a protracted part of the frons (as in *Adelognatha*).—(*Isochnus*) *populi* F. num. L. (4 on 2 slides), PP., 3 I., Bremen, 13.ix.1935, Alfken leg., in leaf-mines on *Salix*, coll. E. no. 2016, dupl. pres. to B.M., M.W., M.K.; adults bred by myself. In the description by Trägårdh (1910, *Arkiv Zool.* **6** (7) : 1–10, f. 1–3, t. 1–2) and his drawing t. 1, f. 8, the prosternum has been considered as having only one sclerite. As a misidentification cannot be possible, this statement must be regarded as erroneous (see f. 91). Trägårdh mentions 3 pairs of epipharyngeal spines and 2 antero-lateral setae. I consider the front pair of epipharyngeal spines in his figure 15 (p. 12) as the inner antero-lateral setae, so that the normal number of both these structures is present.

Rhamphus pulicarius Hbst. 25 L. (15 L. on 4 slides), Schönebeck a. Elbe, ix.1913, C. Urban leg. det. ded. (see Urban, 1930, *Ent. Blätt.* **26** : 97–98), coll. E. no. 1273, dupl. pres. to B.M., M.W.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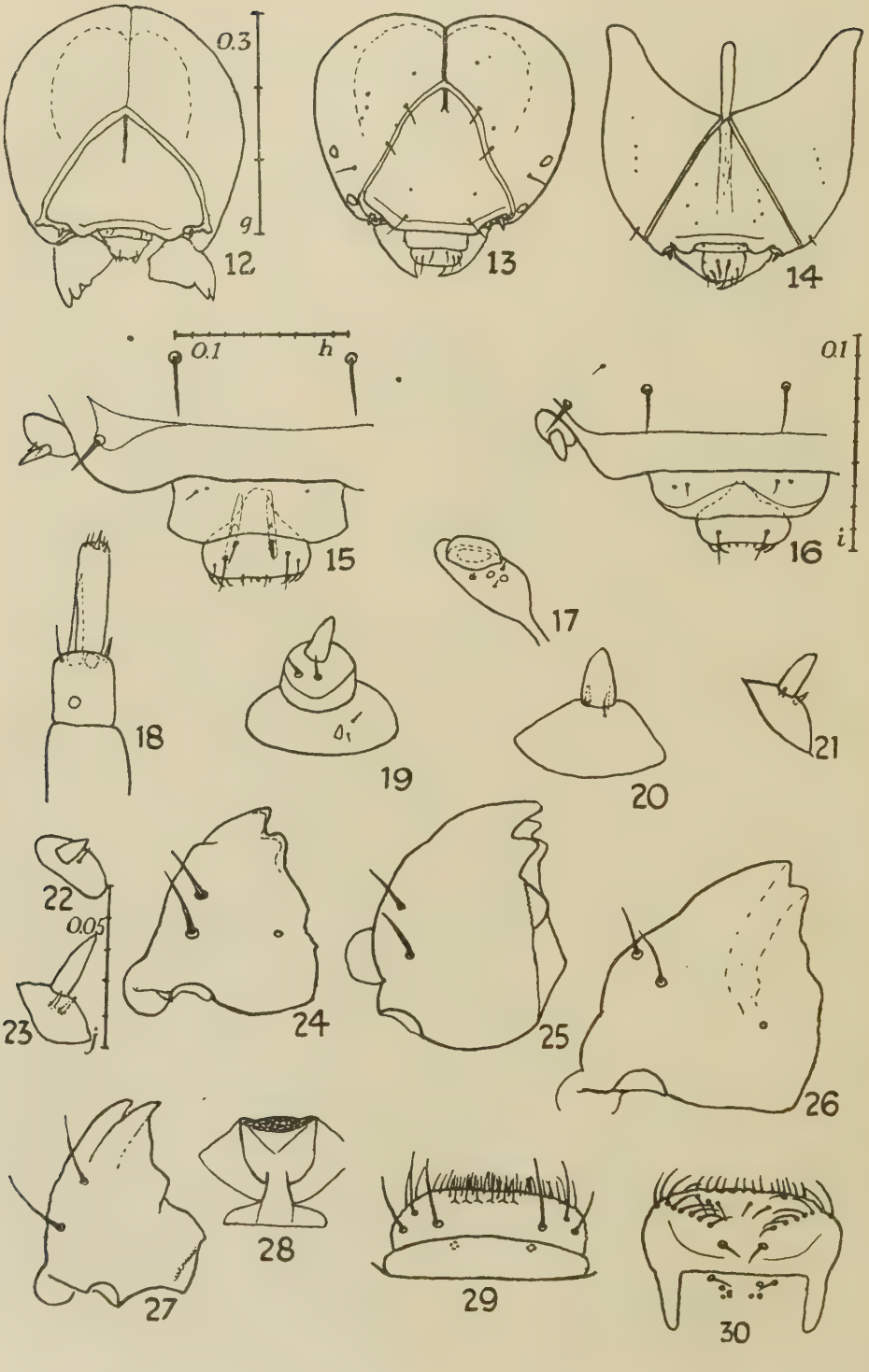
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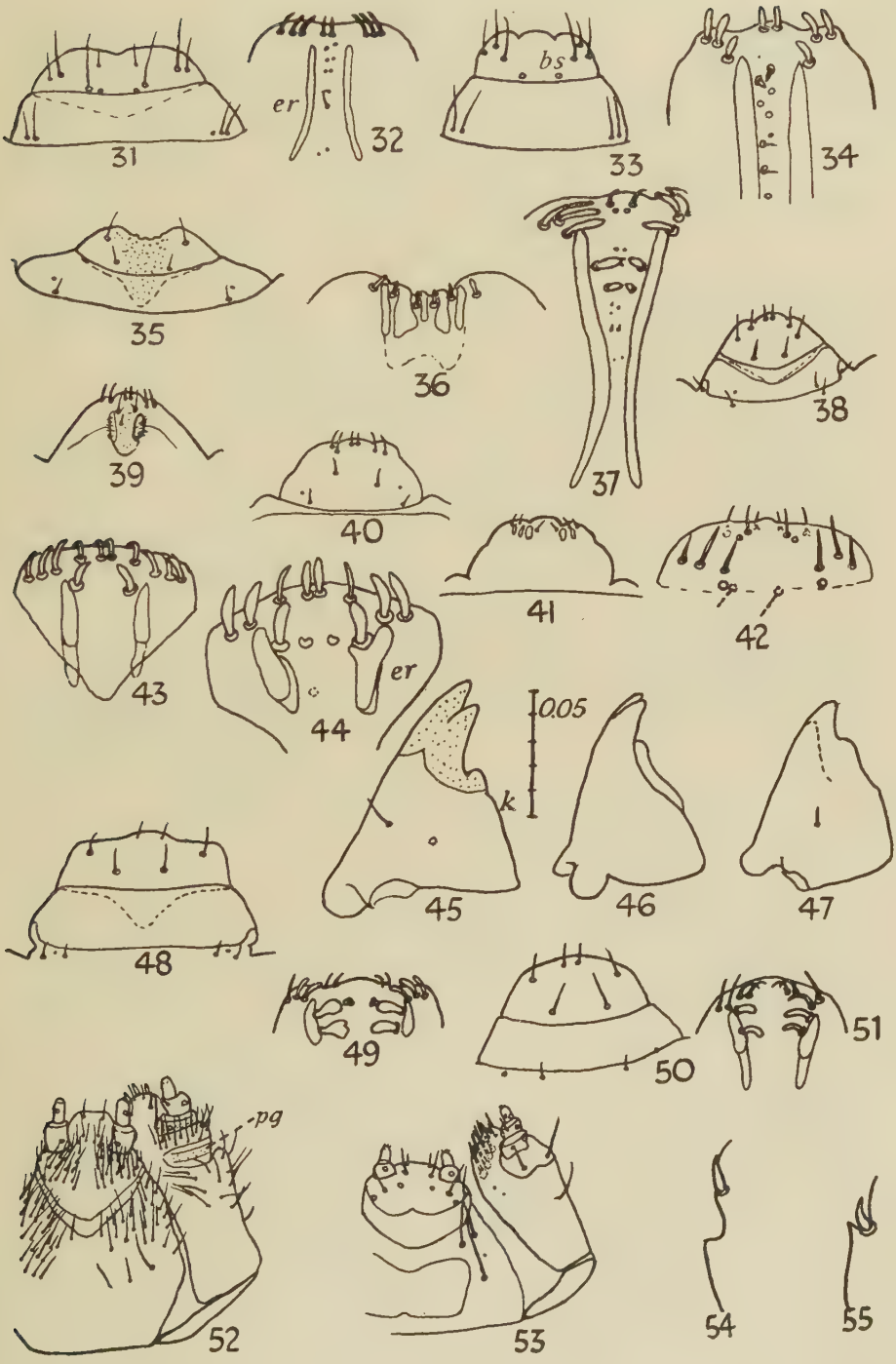
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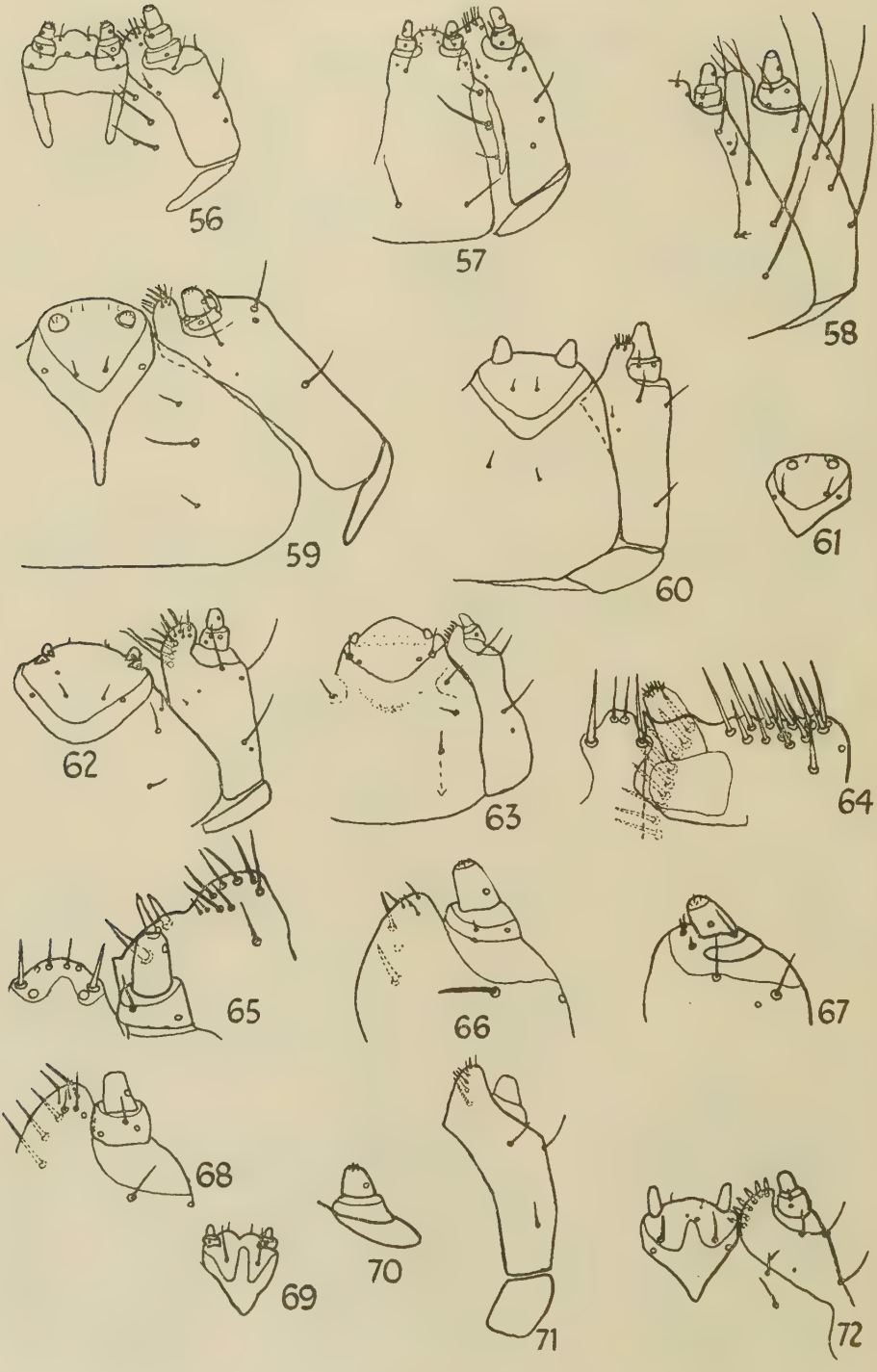
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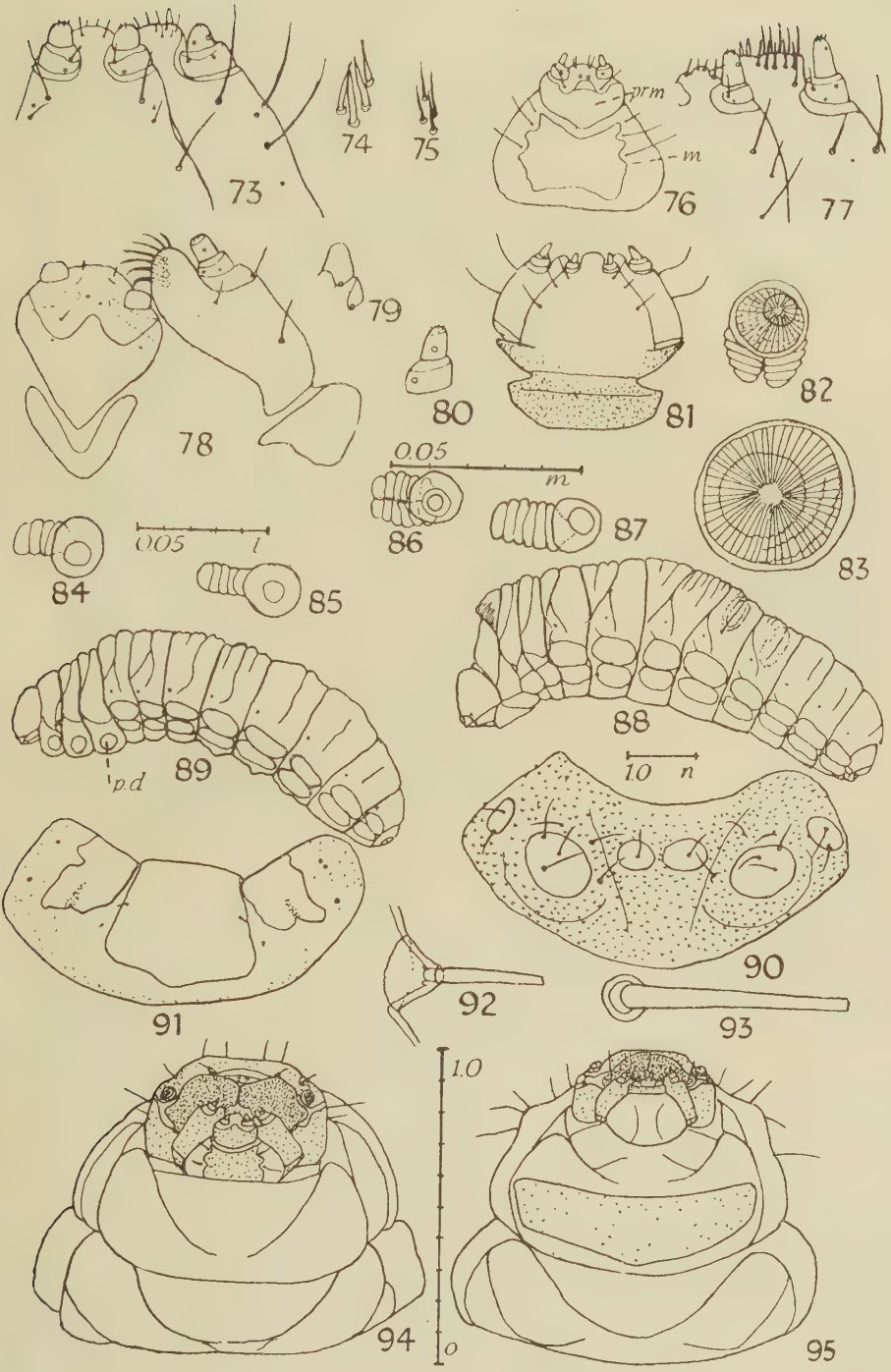
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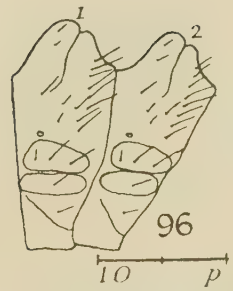

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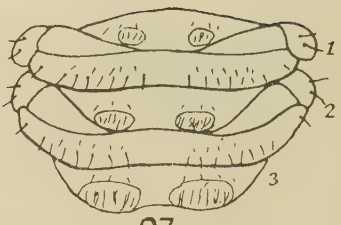

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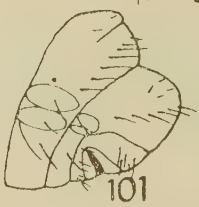
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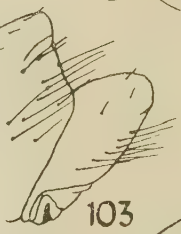
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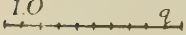

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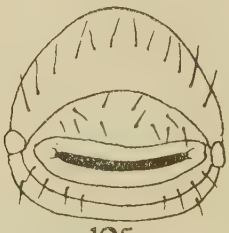
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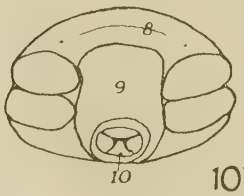

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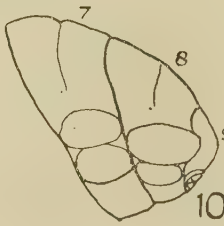

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Explanation of figures.

All figures are of larvae and have—except fig. 106—been drawn with a Leitz microscope and camera lucida. The eye-pieces and objectives used are indicated by the letter L. L O, 3 means eye-piece O, objective 3. The letters a, b, etc. refer to the scale drawn in the same enlargement.

FIG. 1. *Gymnetron antirrhini*, front part of frontal suture. L 4, 3, a. p. process of epicranial halves.—fc faint connection.
2. *Apion loti*, front part of frontal suture. L 4, 3, a.
3. *Cylas formicarius*, side-view of head. L 2, 3, b.
4. *Miarus graminis*, side-view of head. L 2, 3, b.
5. *Belus* sp., head. L O, 2, c.
6. *Rhynchites auratus*, head. L O, 2, c.
7. *Byctiscus betulae*, head. L 1, 2, d.
8. *Allocorrhynus slossoni*, head. L O, 3, e.
9. *Apion ulicis*, head. L 1, 3, f.
10. *A. curtirostre*, head. L 2, 3, b.
11. *A. violaceum*, head. L 1, 3, f.—es epicranial suture, fs frontal sutures.
12. *Gymnetron collinum*, head. L O, 3, e.
13. *Stenopelmus rufinasus*, head. L 3, 3, g.
14. *Rhamphus pulicarius*, head. L 3, 3, g.
15. *Apion violaceum*, antenna, part of frons, clypeus, labrum. L O, 6, h.
16. *A. difficile*, antenna, part of frons, clypeus, labrum. L O, 6, h.
17. *Allodactylus affinis*, right antenna. L 1, 6, i.
18. *Belus* sp., right antenna. L 1, 6, i.
19. *Apoderus quadripunctatus*, right antenna. L 1, 6, i.
20. *A. coryli*, right antenna. L 1, 6, i.
21. *Orobitis cyaneus*, right antenna. L 1, 8, j.
22. *Apion onopordi*, right antenna. L 1, 8, j.
23. *A. loti*, right antenna. L 1, 8, j.
24. *Attelabus nitens*, left mandible. L 4, 3, a.
25. *Apoderus quadripunctatus*, left mandible. L 4, 3, a.
26. *A. coryli*, left mandible. L 4, 3, a.
27. *Cimberis pilosus*, left mandible, molar area transparent. L 4, 3, a.
28. *C. pilosus*, sclerome of hypopharynx. L 4, 3, a.
29. *Belus* sp., labrum. L 3, 3, g.
30. *Belus* sp., epipharynx, sides transposed. L 3, 3, g.
31. *Byctiscus betulae*, labrum. L 3, 3, g.
32. *B. betulae*, epipharynx, sides transposed. L 3, 3, g.
33. *Apoderus coryli*, labrum. L 4, 3, a.—bs basal sensilla.
34. *Attelabus nitens*, epipharynx, sides transposed. L O, 6, h.
35. *Orobitis cyaneus*, labrum. L 4, 3, a.
36. *O. cyaneus*, epipharynx. L O, 6, h.
37. *Deporaus betulae*, epipharynx. L O, 6, h.
38. *Gymnetron collinum*, labrum, sides transposed. L 4, 3, a.
39. *G. collinum*, epipharynx. L 4, 3, a.
40. *G. linariae*, labrum, sides transposed. L 4, 3, a.
41. *G. linariae*, epipharynx. L 4, 3, a.
42. *Allocorrhynus slossoni*, labrum, the only four bristles of the epipharynx transparent. L O, 6, h.
43. *Apion violaceum*, epipharynx. L O, 6, h.
44. *Nanophyes robustus*, epipharynx. L O, 6, h. (basal sensilla transparent).
45. *Apion miniatum*?, left mandible. L 4, 3, a.
46. *Rhamphus pulicarius*, right mandible, ventral aspect. L 2, 6, k.
47. *Rhynchaenus saltator*, left mandible. L O, 6, h.

FIG. 48. *R. saltator*, labrum. L 0, 6, h.
49. *R. saltator*, epipharynx, sides transposed. L 0, 6, h.
50. *Rhamphus pulicarius*, labrum, sides transposed. L 2, 6, k.
51. *R. pulicarius*, epipharynx. L 2, 6, k.

52–81. Lower mouthparts in ventral aspect:

52. *Belus* sp. L 1, 3, f.—pg palpiger.
53. *Rhynchites sericeus*. L 2, 3, b.
54. *R. sericeus*, maxillary tooth. L 2, 6, k.
55. *R. cupreus*, maxillary tooth. L 2, 6, k.
56. *Deporaus betulae*. L 4, 3, a.
57. *Attelabus nitens*. L 1, 3, f.
58. *Himatolabus pubescens* (bristle marked with arrow should be placed more towards the left side). L 4, 3, a.
59. *Apion onopordi*. L 0, 6, h.
60. *Orobitis cyaneus*. L 4, 3, a.
61. *Apion meliloti*, prementum and palpi. L 4, 3, a.
62. *Miarus campanulae*. L 3, 3, g.
63. *Rhynchaenus saltator* (position of basal bristle of submentum abnormal). L 4, 3, a.
64. *Apoderus quadripunctatus*, tip of left maxilla and ligula. L 0, 6, h.
65. *Hoplapoderus gemmatus*, tip of left maxilla and ligula. L 0, 6, h.
66. *Gymnetron antirrhini*, left maxilla, L 0, 6, h.
67. *G. villosulum*, left maxilla. L 0, 6, h.
68. *G. collinum*, left maxilla. L 0, 6, h.
69. *Rhynchites auratus*, prementum and palpi. L 0, 3, e.
70. *Gymnetron linariae*, palpus of left maxilla. L 0, 6, h.
71. *Mecinus heydeni*, left maxilla. L 0, 6, h.
72. *Nanophyes robustus*. L 2, 3, b.
73. *Xestolabus corvinus*. L 4, 3, a.
74. *Bycticus betulae*, dorso-interior row of maxilla. L 0, 6, h.
75. *B. populi*, dorso-interior row of maxilla. L 0, 6, h.
76. *B. betulae*, labium. L 0, 3, e.—prm prementum, m mentum.
77. *Apoderus coryli*. L 2, 3, b.
78. *Stenopelmus rufinasus*. L 0, 6, h.
79. *Miarus campestris*, left labial palpus. L 0, 6, h.
80. *M. graminis*, left labial palpus. L 0, 6, h.
81. *Attelabus nitens*, first-stage larva. L 1, 3, f.

82–87 (right) spiracle of 2nd abdominal segment:

82. *Rhynchites sericeus*. L 0, 8, l.
83. *Apoderus coryli*, left spiracle. L 0, 8, l.
84. *Apion violaceum*. L 2, 8, m.
85. *Orobitis cyaneus*. L 0, 8, l.
86. *Miarus campanulae*. L 0, 6, h.
87. *Gymnetron antirrhini*. L 0, 8, l.
88. *Belus* sp. L 0, 0, n. Hairs omitted.
89. *Cylas formicarius*. L 0, 0, n.—pd pedal discs. Hairs omitted.
90. *Miarus campanulae*, ventral aspect of prothorax. L 0, 3, e.
91. *Rhynchaenus populi*, ventral aspect of prothorax. L 0, 3, e.
92. *Apoderus coryli*, insertion of bristle. L 0, 6, h.
93. *Attelabus nitens*, insertion of bristle. L 0, 6, h.
94. *Bycticus betulae*, head, prothorax, mesothorax, ventral aspect, bristles mostly omitted. L 0, 2, c.
95. *Deporaus betulae*, head, prothorax, mesothorax, ventral aspect, bristles mostly omitted. L 2, 2, o.

FIG. 96. *Apoderus coryli*, 1st and 2nd abdominal segments, lateral view. L 3, 0, p.
97. *Byctiscus betulae*, 1st, 2nd and anterior fold of 3rd abdominal segments, dorsal view. L 3, 0, p.
98. *Rhynchites auratus*. L 3, 0, p.
99. *Otiorrhynchus cribricollis* Gyll., 5th and 6th abdominal segments, lateral view. L 3, 0, p.
100. *Attelabus nitens*, 8th to 10th abdominal segments, lateral view. L 3, 0, p.
101. *Apoderus quadripunctatus*, 8th to 10th abdominal segments, lateral view. L 3, 0, p.
102. *A. coryli*, 8th to 10th abdominal segments, lateral view. L 3, 0, p.
103. *Hoplapoderus gemmatus*, 8th to 10th abdominal segments, lateral view. L 0, 2, q.
104. *Rhynchites auratus*, 9th and 10th abdominal segments, seen from behind. L 0, 2, c.
105. *Apoderus quadripunctatus*, 9th and 10th abdominal segments, seen from below. L 0, 2, c.
106. *Belus* sp., 9th and 10th abdominal segments, seen from behind.
107. *Allocorrhynus slossoni*, 8th to 10th abdominal segments, seen from behind. L 0, 2, q.
108. *A. slossoni*, 7th to 10th abdominal segments, lateral view. L 0, 2, q.